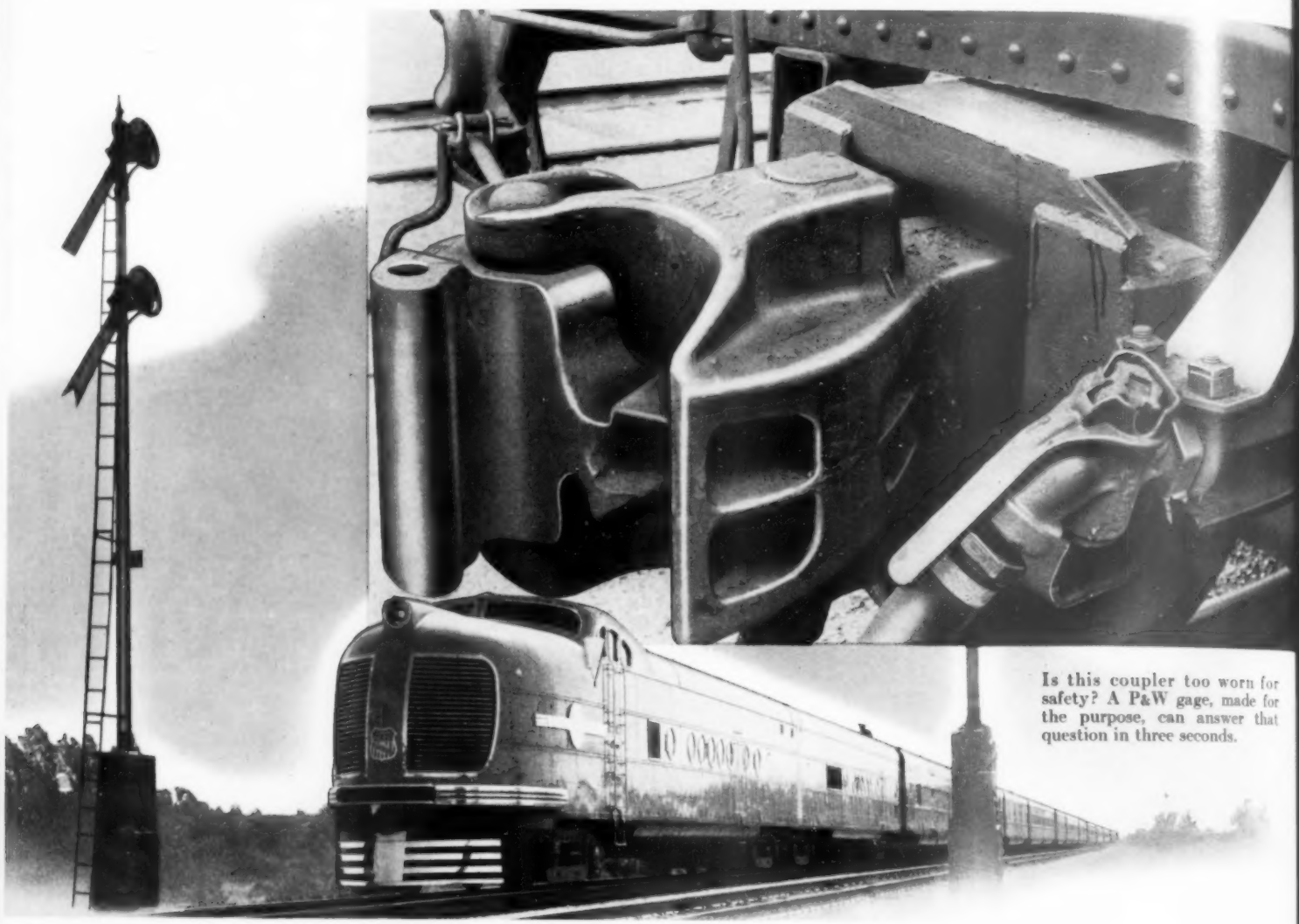
MAY 1942

The TOOL ENGINEER

MACHINERY • PRODUCTION • TOOLS

Official Publication of the American Society of Tool Engineers

One of our TOUGHEST CUSTOMERS



Is this coupler too worn for safety? A P&W gage, made for the purpose, can answer that question in three seconds.

This gage shows how much metal must be removed to restore the original wheel contour, and how much service metal will be left.

IF you were going to create a railroad . . . build your own locomotives, cars, signal systems, and all the rest . . . about the first source of supply you'd seek out would be Pratt & Whitney. One way or another, you'd need almost the whole wide range of P&W products. Our big, super-accurate Keller machines, jig borers, lathes, shapers, and grinders go into many phases of locomotive and rolling stock manufacture. Our cutting tools — many like staybolt taps, bridge reamers, mud taps, milling cutters — are made expressly for railroads — used in both manufacturing and maintenance. Our gages serve all along the line . . . right from building to accurate standards to checking wheels and couplers in service.

P&W accuracy keeps 'em rolling *longer, faster, safer.* Our engineers have long worked closely with the Association of American Railroads — tough customers who won't even look at anything but the best. They talk our language — they recognize the value of accuracy. They're vital to Victory . . . we'll help them do their part.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

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STANDARD
Dial Snap Gages

"CONVOY YOUR PARTS THRU PRODUCTION"

STANDARD GAGE CO., INC.
POUGHKEEPSIE, NEW YORK

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THE TOOL ENGINEER

Volume XI MAY, 1942 Number 5

Articles

Editorial

Features

News

ARMOR-PLATE WELDING

Conventional welding on armor plate which might take 11 or more hours is now being done in 25 minutes. Read "Unionmelt Welding—dark horse of defense," this month's lead article. Tried with unusual success in shipyards, this automatic process was seized upon by tank manufacturers' Tool Engineers who had cussed armor plate for being about as easy to work with as a starched shirt. There are still kinks to work out. THE TOOL ENGINEER is keeping its eye on daily progress. Watch for further reports in early issues.

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CCA
Controlled Circulation Audit, Inc.
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Special Multiple-Spindle Milling Machine

This special 7-spindle machine was designed by our engineers for the mass production of saddles for Milwaukee Milling Machines . . . a higher degree of accuracy was obtained than by previous methods . . . and production was increased 350 per cent.

KEARNEY & TRECKER CORP., MILWAUKEE, WIS., U. S. A.

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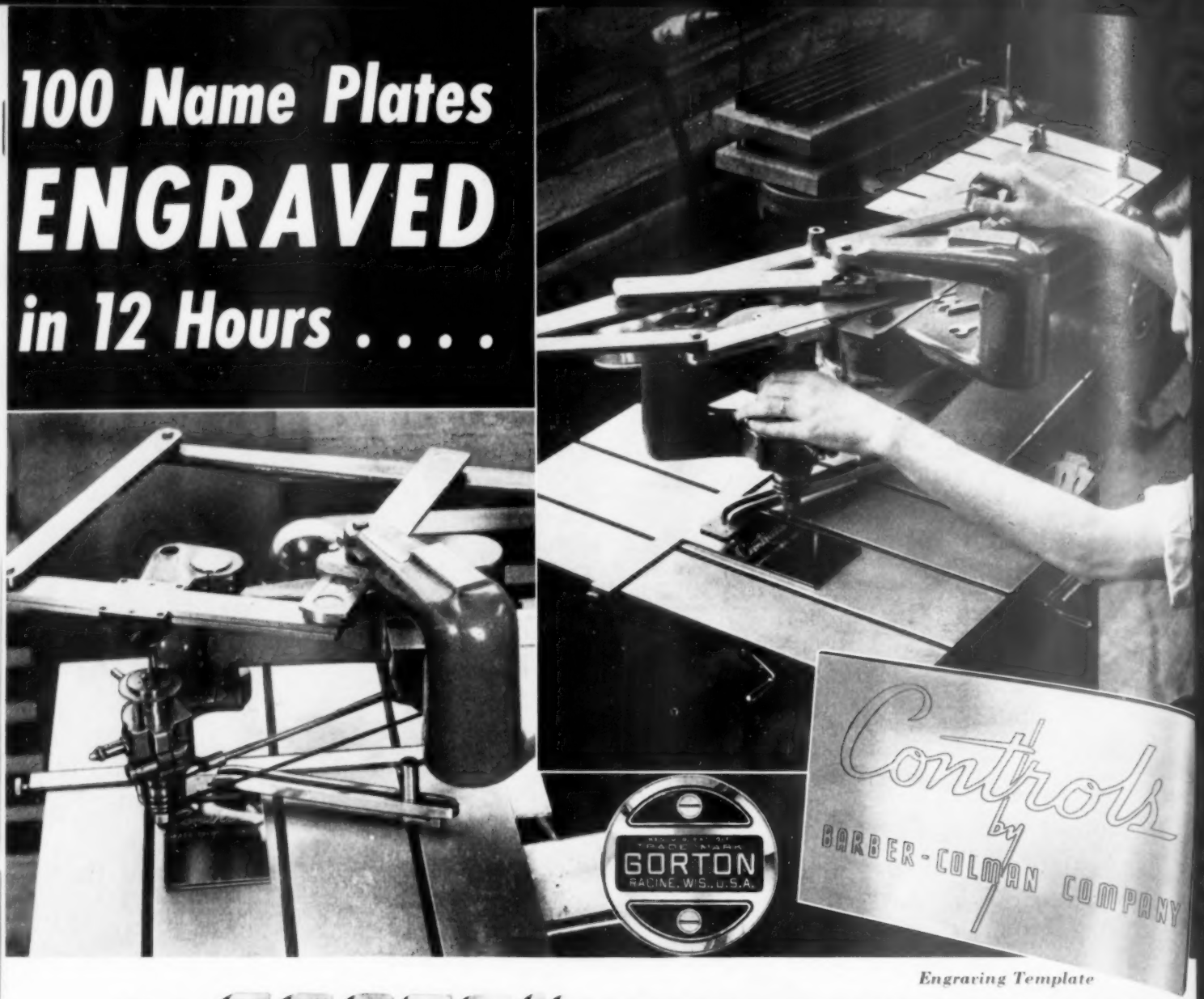
Milwaukee
MILLING MACHINES

Milwaukee MILLING MACHINES

100 Name Plates ENGRAVED in 12 Hours . . . .



Engraving Template

...ON A GORTON PANTOGRAPH ENGRAVING MACHINE

ENGRAVING 100 name plates in 12 hours without resharpening the tool, at the Barber-Colman Company, Rockford, Illinois, is a typical example of what can be produced on a Gorton Pantograph Engraver.

The operator is shown engraving a bakelite name plate for a Barber-Colman control unit panel. The name plate is copied from a template (shown above) using a 5/16" diameter carboloy-tipped cutter. The tracer point is guided by hand around the outline of the template, which is clamped on the copy table.

In addition, the Pantograph Engraver may be used for engraving dies, molds, dials, flat and curved work, and other general engraving work. The machine may be operated by unskilled labor, and only a few minutes are required to explain the operation of the machine.

If you have work of this type in your plant, the installation of a Gorton Pantograph Engraver will not only improve the appearance of your product, but may also reduce the cost on all of your engraving work. Your request for additional information on Pantograph Machines will not obligate you, and will give you the information necessary for checking more carefully into its possibilities for your work.

FREE CATALOG—Send today for your FREE copy of Bulletin No. 1580-A, showing how Gorton 2 and 3 Dimensional Pantograph Machines are used to produce Stencils, Dies, Rolls, Steel Stamps, Relief Engraving and general flat work.

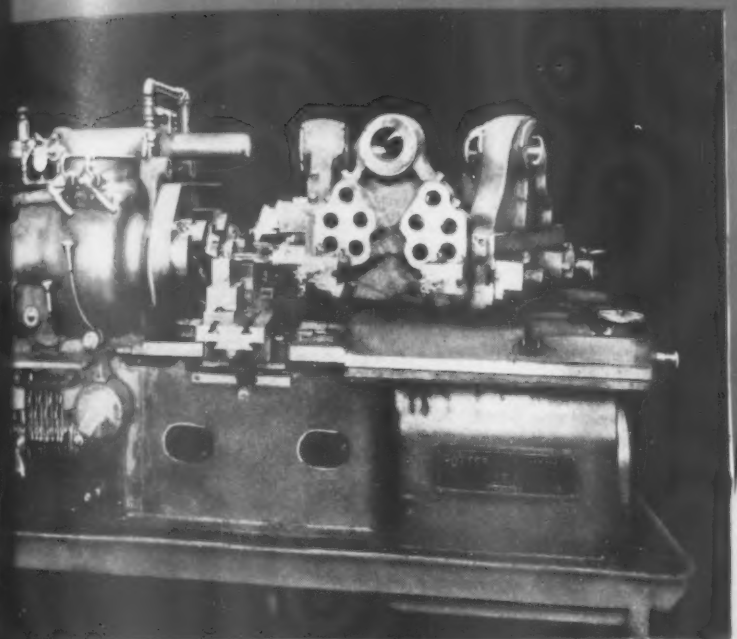
GEORGE GORTON MACHINE CO.

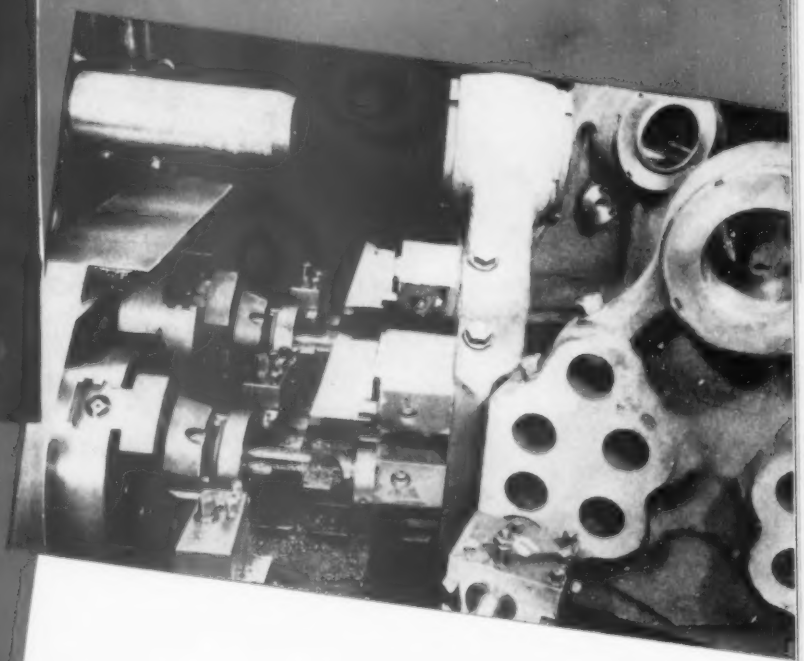
1322 RACINE STREET, RACINE, WISCONSIN, U.S.A.

SPECIALISTS IN ENGRAVING, DIE MAKING AND SUPER-SPEED VERTICAL MILLING

*Results ON A P&J FROM PLANNED PRODUCTION

5D Two Spindle POWERFLEX





* 23 TRACTOR PARTS PER 51-MINUTE HOUR.

THE JOB AND HOW IT IS HANDLED

Part: Tractor Track Roller Shaft Bracket
Material: Malleable Iron
Machining Time: One operation only—Two subjects 3.91 minutes
Floor to Floor Time: 4.21 minutes
Production: 23 Brackets per 51 minute hour

Operation: Cross slide operates simultaneously with the tools mounted on turret allowing rough and finish facing cuts to be taken without loss of time. It also provides an operating mechanism for auxiliary slide tool mounted on turret face. Tools mounted on the auxiliary slide tool are used for machining of angular recess groove.

Machining Operations:
1st T.F.: Rough bore hole; bore and face 3⅛" dia. turn O.D.
2nd T.F.: Rough face end; rough machine groove for belt oil seal
3rd T.F.: Finish bore hole; bore and face 3⅛" face end
4th T.F.: Finish machine groove
5th T.F.: Ream hole

The advantages of 2-spindle output from single spindle floor space as well as savings in power and initial investment are being realized in many shops where these P&J automatic Chucking Machines are installed.

A recent installation in the plant of a mid-western tractor manufacturer exemplifies these advantages. Note from the photographs the simple form of tooling required for producing track roller shaft brackets. The tool holders mounted on the several turret faces as well as the extremely rigid form of overhead pilot are features included in the standard 2-spindle machine at no extra cost.

P&J offers the 5-D 2-spindle POWERFLEX in three sizes, 9", 12" and 15". The outstanding characteristics of all sizes are extreme rigidity of spindle mounting, turret slide and cross slide, long life, and maintained accuracy under high production demands.

On the class of work shown here, one operator can readily handle three machines of this type.

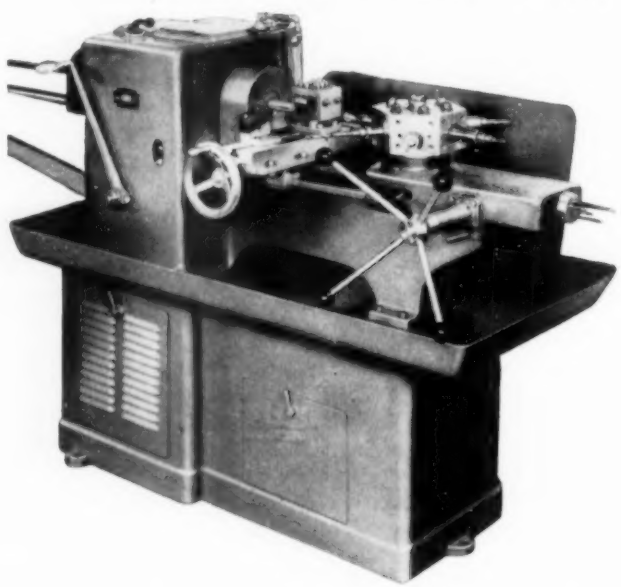
POTTER & JOHNSTON MACHINE CO.

PAWTUCKET, RHODE ISLAND

SIX IMPORTANT ADVANTAGES GAINED WITH OSTER No. 601 SIMPLIFIED TURRET LATHE

The Oster No. 601 SIMPLIFIED Turret Lathe meets today's urgent needs for a low cost, motor driven bar and chucking machine for a wide range of small diameter jobs not requiring complicated, costly equipment or highly skilled set-up men and operators.

For complete details, fill out form below and mail. A copy of illustrated Catalog No. 27-A will be sent to you promptly.



1 **Release your more complicated, costlier machines for other work.** The Oster No. 601 Turret Lathe has proved its efficiency on a wide variety of bar and chucking operations in the small diameter range up to 1½-inch.

2 **Release your highly skilled set-up men and operators** for work demanding their expert services. The Oster No. 601 Turret Lathe has hand feed to cross slide and manually operated, six station turret.

3 **Speed up training of new operators.** The simplified design and operation of the Oster No. 601 Turret Lathe saves months in training new men to high standards of efficiency.

4 **Maintain flexibility for quick change-overs** from job to job. For example, a battery of six Oster No. 601 Turret Lathes permits using all six machines on identical work, or, at any time, releasing one or more of the six machines for different work.

5 **Obtain quicker deliveries of Oster No. 601 Turret Lathes** and eliminate costly delays waiting for shipments of more complicated machines which you may need now but can't get for months to come.

6 **Save money on initial investment in machinery.** The Oster No. 601 Turret Lathe equipped with optional *worm drive* or *direct drive* and *six station turret* costs less than $2000 without tools and fixtures.

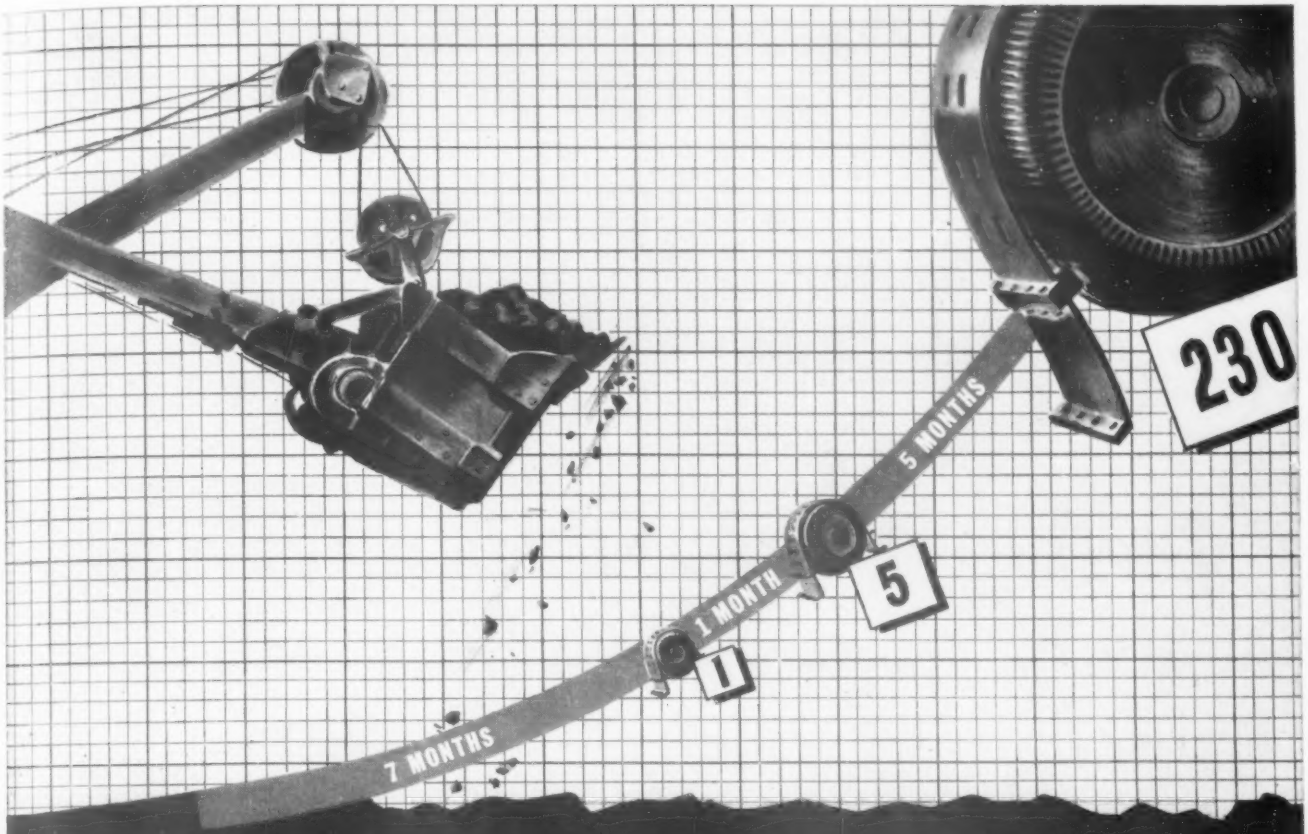
THE OSTER MFG. CO. • 2063 East 61st St., Cleveland, Ohio

Rush, by return mail ..... copies of Catalog No. 27-A which contains full description and detailed illustrations of No. 601 Turret Lathe.

NAME .....

ADDRESS .....

CITY ..... STATE .....



How Industrial Distributors helped a Generator Manufacturer to start production ahead of schedule

Have *you* learned how to utilize your Industrial Supply Distributor's ability to help you through production emergencies? One big Western manufacturer, rushing a war plant to cover nearly Two Million feet of floor space, discovered that a large volume of important machinery was desperately needed but hadn't even been ordered.

Threatened by heavy penalties, Management called in local Industrial Distributors, who:—

1—Opened up new sources of supply and delivered equipment as fast as it could be installed.

2—Helped the Purchasing Department secure its first stocks of materials and set up a system for keeping further supplies coming on schedule.

This incident is typical of the unusual services that many Mill Supply Distributors are rendering their customers during the Emergency.

With co-operation from everyone, the Manufacturer produced his first unit within 7 *winter months* after ground was broken.

In 60 days, 25 additional units had been completed, and 4 months later, almost 400 more. Output has since moved rapidly toward the monthly capacity of 1,000 units.

We hope you are depending on your Mill Supply House with the same confidence when *buying*, that we do when *selling*. For Cle-Forge High-Speed Drills and Peerless High-Speed Reamers reach your stock-rooms through Industrial Distributing channels exclusively.

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49TH STREET
CLEVELAND

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

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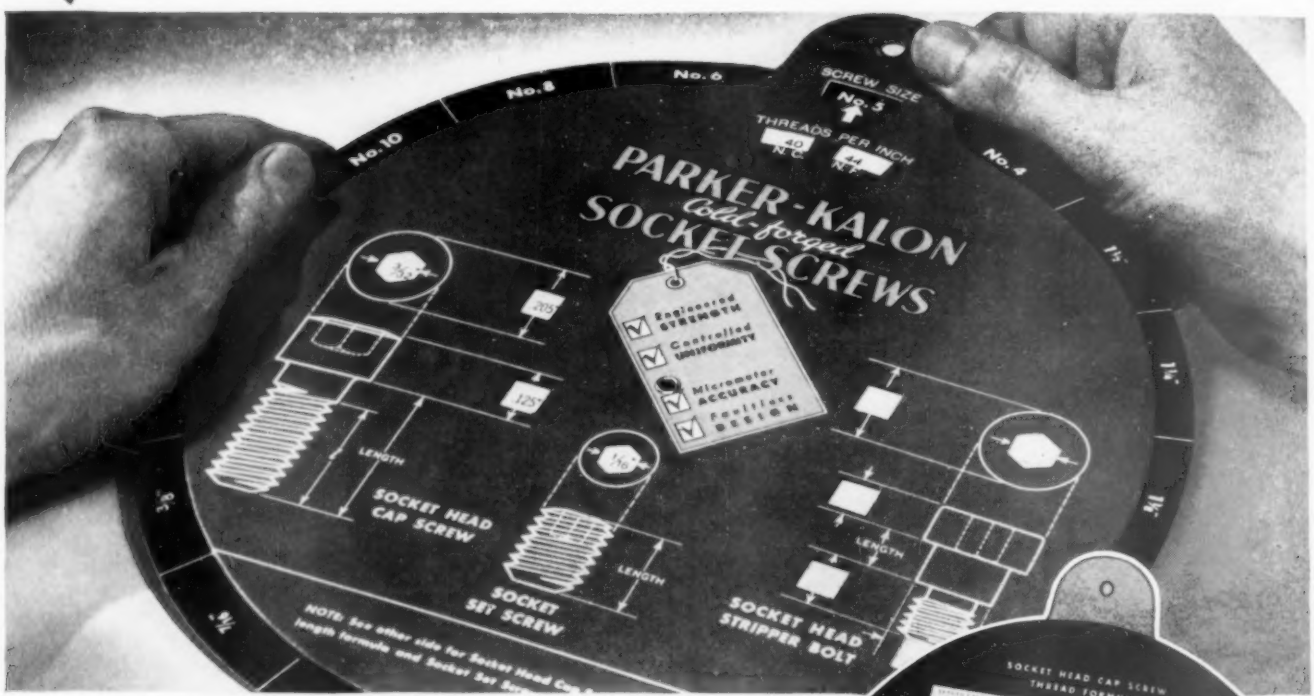
"CLEVELAND" DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU

Free! SOCKET SCREW DIMENSION FINDER

that will help you speed up work!



REVERSE SIDE

At A Glance -- it gives designers, engineers and production men all important data on Socket Screws!

This unique chart will save you precious minutes and annoyance. A turn of the dial brings before you, in large, easy-to-read figures, all the important dimensions of the standard sizes of Socket Head Cap Screws, Stripper Bolts and Set Screws. On the reverse side you have a table of Set Screw Point Dimensions . . . Cap Screw Thread-length Formula . . . and other useful data. Ten inches in diameter, bright in color, this Finder won't get "lost" on a busy table. Hang it on your wall or drafting board by the metal reinforced hole.

SUPPLY IS LIMITED . . . so this offer of the Finder must be restricted to designers, engineers, drafting and production men in key positions who ask for a copy at an early date. Fill in coupon . . . and please be sure to attach to your company's letterhead.

PARKER-KALON CORP., 190-198 VARICK ST., NEW YORK, N. Y.
Please send the Parker-Kalon Socket Screw Dimension Finder.

Name _____ Position _____

Company _____

Address _____

Make of Socket Screw we use _____

PARKER-KALON
Quality-Controlled
SOCKET SCREWS

Give the Green Light to Defense Assemblies

SPEED PRODUCTION WITH BETTER TOOLS AND SAVE VITAL ALLOYS

THESE BULLETINS TELL HOW

Mail this Coupon Today

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Gentlemen: Please send me without obligation the FREE BULLETINS I have checked below. (Bulletins contain sizes and prices.) TE-5

- ☐ **FIRTHITE Tools, General Purpose**
- ☐ **FIRTHITE Tips, Standard**
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NAME _____

COMPANY _____ POSITION _____

ADDRESS _____

Nicainor Kendall

1834

When Nicainor Kendall pulled his rifle from under the robe of his sleigh, the hammer caught and the piece went off — nearly killing his fiancée. This accident led him to design the peculiar "underhammer lock" — one of the first safety devices ever built in a firearm. Not only was it safer, but this lock was simpler. It had fewer working parts — and parts were interchangeable from lock to lock. Here is one of the earliest examples of successful application of a fundamental principle of modern machine tool technique. Other examples have followed in constant succession. Thus, from Nicainor Kendall's little Vermont shop, Jones & Lamson Machine Company traces more than a century of continuous progress.

JONES &

Jones & Lamson Automatic Thread Grinder
Model TG-615

OPTICAL COMPARATORS

RAM TYPE
UNIVERSAL TURRET LATHE

strove for safety

and achieved simplicity

THE underhammer rifle that Kendall first designed has long been superseded by faster, more accurate, more powerful weapons. The mechanical principles by which Nicainor Kendall worked have long been the common property of progressive engineers.

But leadership in the application of those principles did not die with Nicainor Kendall. Nor did it die with men like Robbins, Howe, Hilliard and Hartness, whose successors are responsible for the most recent advances in Jones & Lamson machine tool technique.

As a result of these advances, modern Jones & Lamson machine tools, optical comparators and threading tools embody numerous unique advantages.

In Jones & Lamson machine tools, these advantages are apparent, not only in refinement and ease of operation, but in ample reserves of speed, rigidity and useful power, enabling you to make the fullest possible use of each new development of hard alloy cutting tools. Thus you can speed Wartime production and be prepared to meet the keen competition of a postwar world.

Write today to Jones & Lamson engineers regarding your production problems. Inquiries from large plants or small receive prompt and thorough study here.

LAMSON MACHINE COMPANY

SPRINGFIELD, VT., U. S. A.

Jones & Lamson Automatic Internal Thread Grinder Model TG-624.

Manufacturers of Ram & Saddle Type Universal Turret Lathes . . . Fay Automatic Lathes . . . Automatic Thread Grinding Machines . . . Comparators . . . Automatic Opening Threading Dies and Chasers

SADDLE TYPE UNIVERSAL TURRET LATHE

FAY AUTOMATIC LATHES

AUTOMATIC OPENING DIE HEADS

PROFIT PRODUCING MACHINE TOOLS

Micromatic Anticipates Future

1. Micromatic work holding fixtures assure MAXIMUM EFFICIENCY in GENERATING FINAL SIZE, GEOMETRIC ACCURACY, SURFACE QUALITY and SURFACE FINISH.

2. Micromatic Manually Controlled Huttohones fulfill lower production needs with minimized equipment for any amount of stock removal desired.

3. Micromatic Automatically Controlled Microhones are specific purpose tools, for stock removal usually not exceeding .003" to .004" at rate of .001" per minute.

4. Micromatic Hydraulically Controlled Hydrohones and Drawfinishing Tools are specific purpose tools, for rapid stock removal up to .025" to .030" at rate of .010" to .012" per minute.

5. Micromatic Hydraulically Controlled Tubing Hones remove from .001" to .075" stock in bores up to 30" diameter x 75 feet long—at rates up to .012" per hour—generate accuracy within .0005" to .001".

6. Micromatic Hydraulically Controlled Hydrohones (with or without remote control) remove from .001" stock upwards in tubing and large diesel liners—at rates up to .012" per hour—generate accuracy within .001".

7. Micromatic Model 100 Hydrohoner with Automatic Microsize Control and Loading removes up to .002" or .003" stock in bores from ¼" to 1" diameter x 6" long—generates accuracy within .0001" to .0002" and size within .0005"—at rates up to 200-240 pieces per hour.

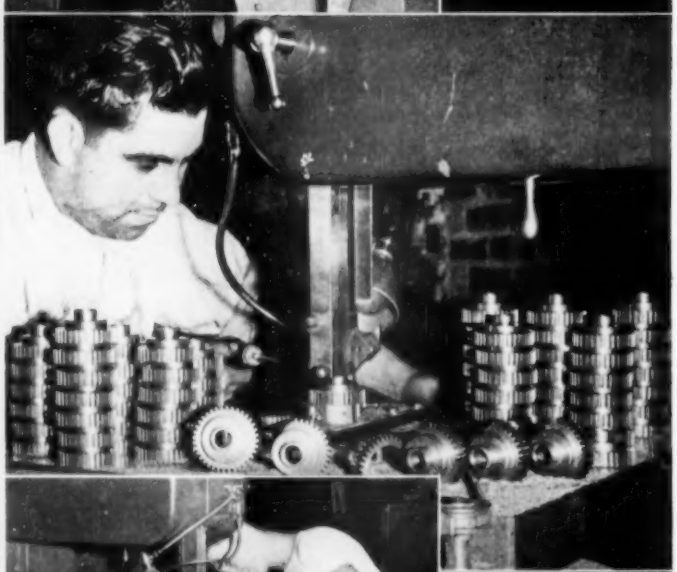
8. Micromatic Model 200 Hydrohoner removes up to .003" or .005" stock in bores from 1" to 2" diameter x 6" long—generates accuracy within .0001" to .0003"—at rates up to 120-140 pieces per hour.

9. Write for Bulletin AR-57: "Microfinish" and Bulletin AR-60: "The Micromatic Hydrohoner".

MICROMATIC HONE CORPORATION

Variable pitch Propeller Blades made on the DoAll with great savings of time.

Special Parts made on the DoAll in a fraction of former time.



Sector Gears cut in 5 minutes each. Formerly took 30 minutes each on a miller.

Disc Rims polished on the DoAll in 2 minutes each. Formerly took 1 hour each by hand.

DoAll

● No, we don't need any more time. We have as much time as our enemies, but we do need ***more production per hour,*** and that's where the DoAll Contour Machine is doing such a magnificent job—knocking former shape cutting records into a cocked hat!

ON THE JOB 24 HOURS A DAY

In every modern plant from coast to coast, wherever war orders are going through on direct or sub contract, you'll find the DoAll doing all kinds of special production cutting, relieving $5,000 to $50,000 machine tools for other work.

★ ★ ★

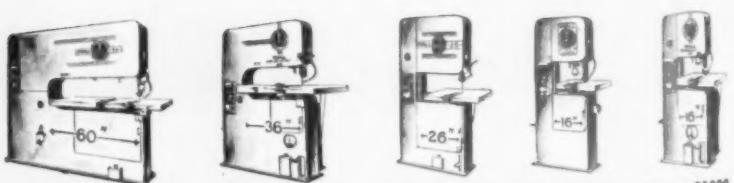
Don't care what the metal or alloy is—there's a DoAll band to do the job not only quicker, but smoother and better.

Fastest Precision Method to Remove Metal

For external and internal sawing of all metals and alloys (flats, blocks, bars, sheets or tubing)—for making special tools and parts without dies—for regular production work—investigate the DoAll, wonder machine of our day. There are 5 models with throat capacities ranging from 16" to 60", priced from $1000 to $5000, including motors.

Ask to have a factory-trained man call and show you how much time and energy a DoAll can save in your plant.

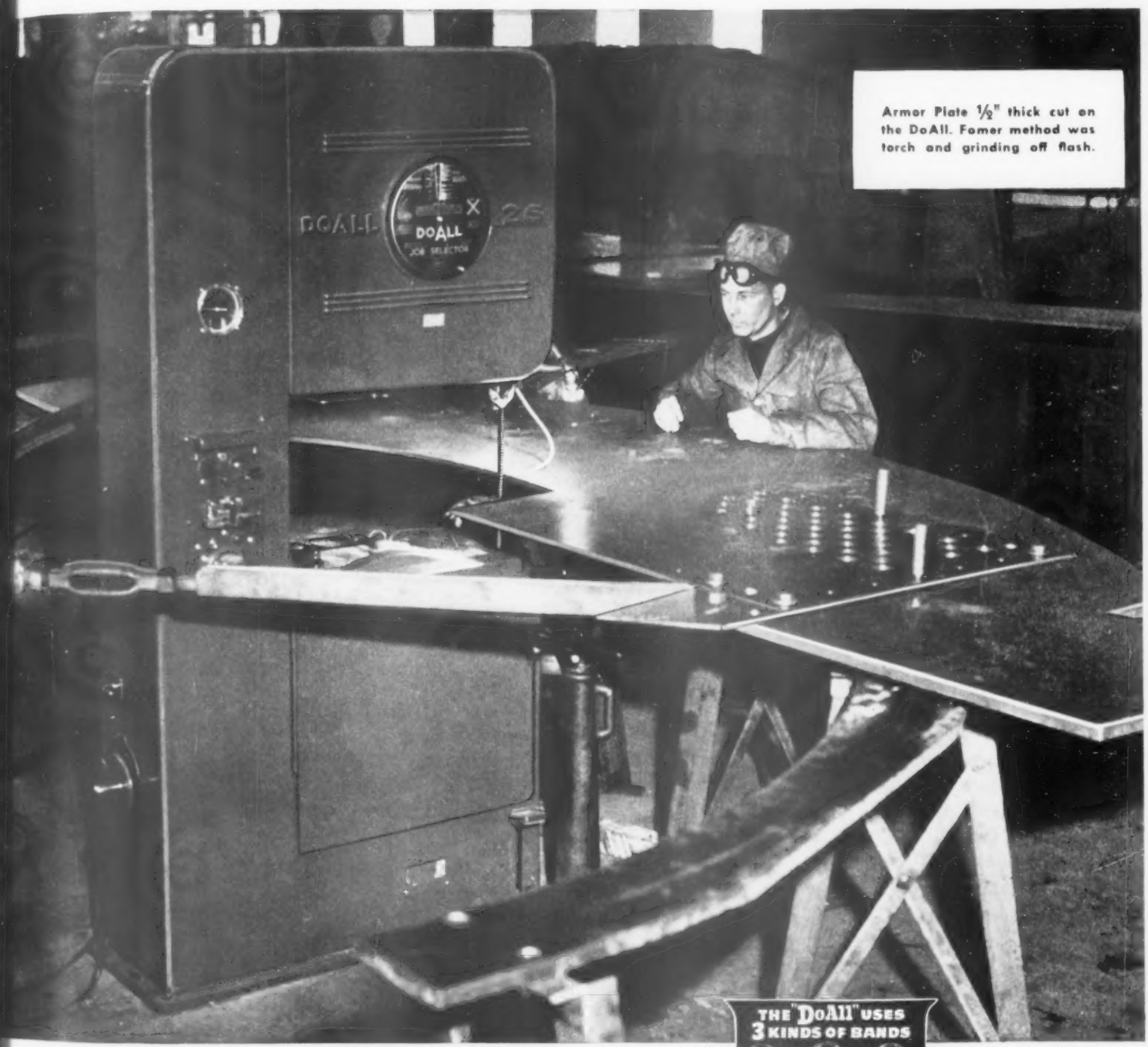
THE EXACT SIZE FOR YOUR JOB



Under $5000 Under $2500 Under $2000 Under $1500 Under $1000

ALL MODELS WITH MOTORS

PRODUCTION
TURNS MAN HOURS INTO MINUTES



Armor Plate ½" thick cut on the DoAll. Fomer method was torch and grinding off flash.

CONTINENTAL MACHINES, INC.

1304 S. Washington Ave., Minneapolis, Minn.

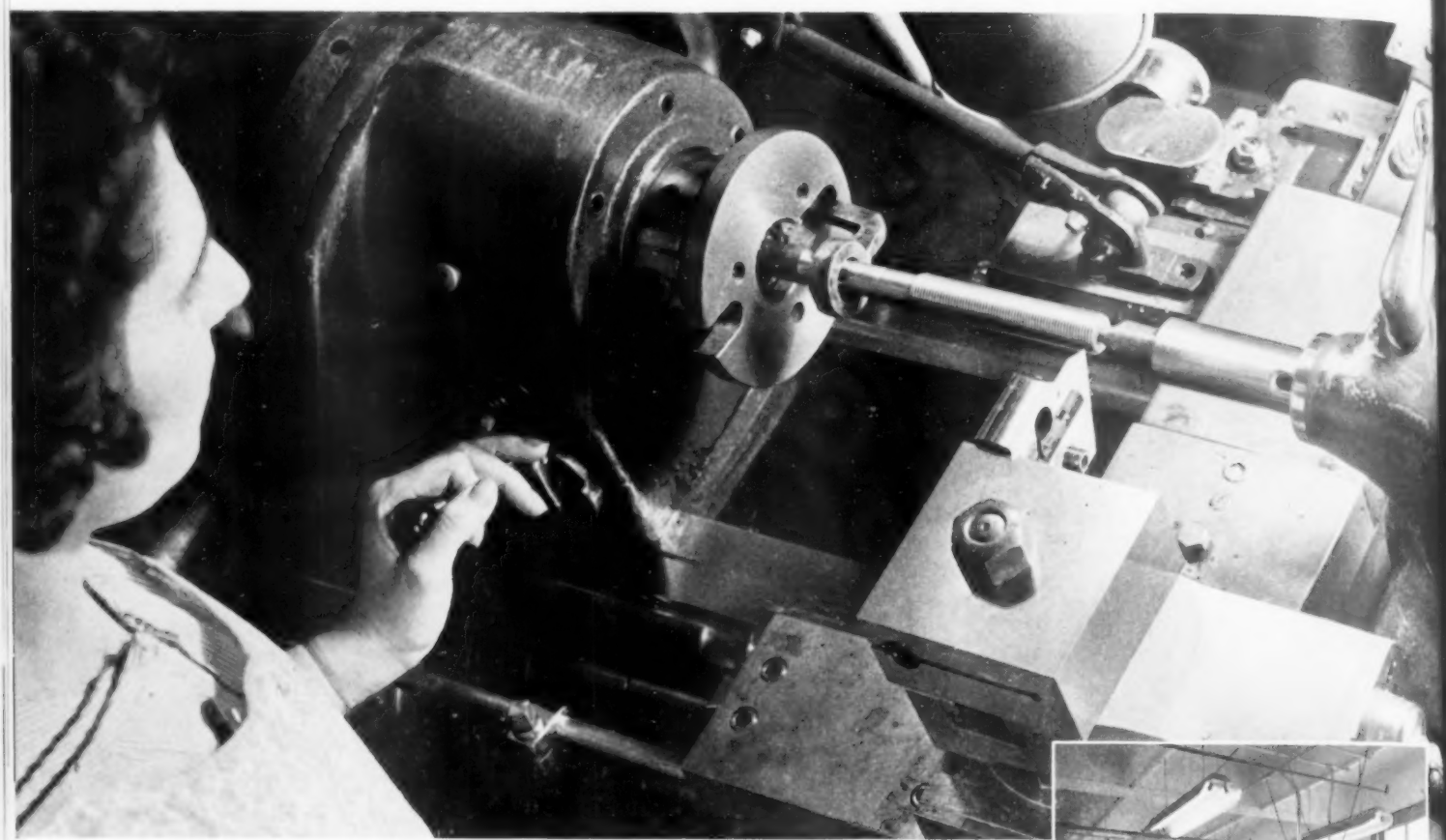
Associated with the DoAll Company, Des Plaines, Ill.

Manufacturers of Band Saws and Band Files for DoAll Contour Machines

NEW—Send for helpful book "DoAll o Production" for bird's - eye view o real accomplishment

New Operators

TRAINED QUICKLY FOR HIGH PRECISION WORK

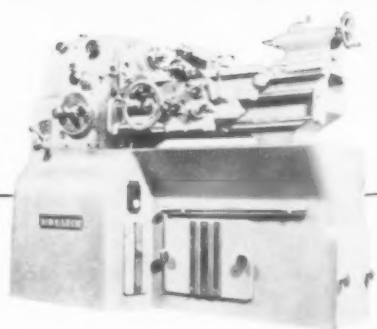


Chasing thread gage laps is one of the most accurate operations in gage work, yet within a few weeks after installing their first machine in this department, The Taft-Peirce Manufacturing Company of Woonsocket, R. I., is operating its entire battery of 16 Monarch Sensitive Precision Lathes with previously untrained help. In spite of this seemingly short training period, production rate is high, accuracy well within required tolerances, and the number of rejects surprisingly low.

To maintain production, the first Monarchs delivered were manned by experienced workers. One by one, new operators were carefully trained, and now have released these skilled men for other work.

This is one of many examples which prove the utility of Monarch Lathes. Simple and easy operation allows immediate production of many repetitive jobs by previously unskilled operators. Accuracy is so much a basic part of Monarch Lathe design that neither quality of work nor production rate suffers by such emergency measures.

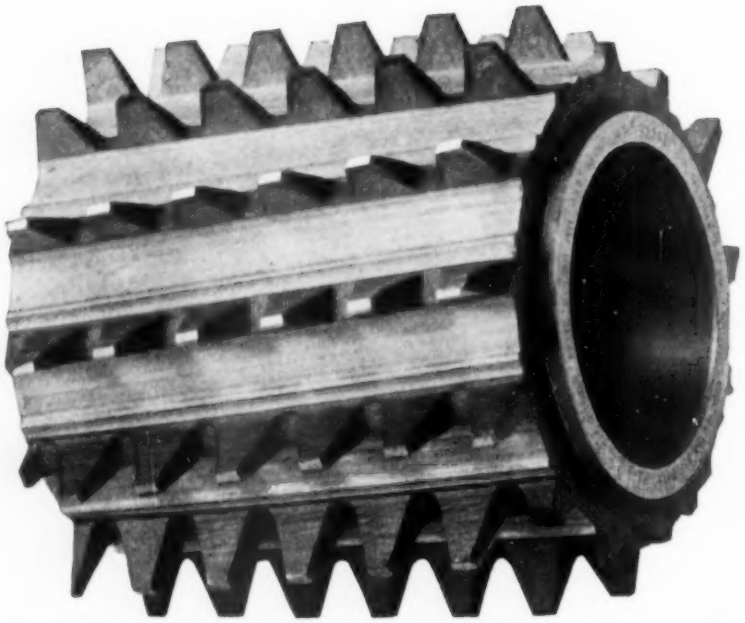
Further—this is additional proof that even under present production pressure, there is no letdown in Monarch quality.



THE MONARCH MACHINE TOOL COMPANY • • • SIDNEY • OHIO

MONARCH LATHES

COVER THE TURNING FIELD



THIS HOB produced 66,937 lineal inches of gear tooth in the six months preceding its "retirement". The teeth were ground back until they were only 5/64" thick at the tip, yet not a single tooth broke out. Made double-thread, ground form, this hob was used to cut 35 tooth, 5-7 pitch gears, 7-1/4 diameter by 1-1/4 face. Material was SAE 4620 annealed steel. Average production, using .060 feed per revolution of work and hob speed 154 r.p.m., was 10.6 gears per hour. Total life was 29 sharpenings, with .019" stock removed per grind. 3 settings per grind, 18 pieces per setting were obtained.

PROPER HOB SHARPENING GIVES LONG LIFE AND MAXIMUM PRODUCTION

"Conserve critical materials!" This is an important watchword in these times of war. Users of hobs are vitally affected as it becomes necessary to get the greatest possible production from cutting tools of all kinds. The following precautions will be helpful in this effort, to assist you in getting the maximum life out of your hobs.

OBSERVE THESE SUGGESTIONS...

1. Use index method of sharpening. Maintain proper spacing of flutes.

2. Be sure that hob teeth are sharpened radially. Avoid a positive or negative rake, except in cases where it is recommended, such as B-C *Hi*-Production Hobs.

3. Guard against hob runout on either or both ends on the sharpening machine.

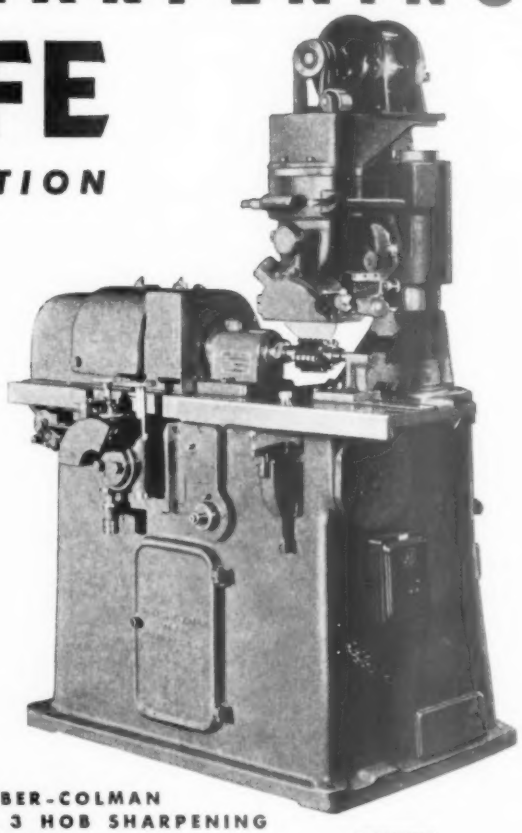
4. Do not allow hobs to become excessively dull in one position. Sharpen at regularly determined intervals, whether the hob "looks like it needs it or not."

5. Always remove a uniform amount of stock.

6. Be sure to select the proper grade of grinding wheel.

7. Shift hob position frequently.

8. Correlate feed and speed to be used, with the production desired, so that resulting hob cost will not offset the advantages of the increase in production.



BARBER-COLMAN NO. 3 HOB SHARPENING MACHINE

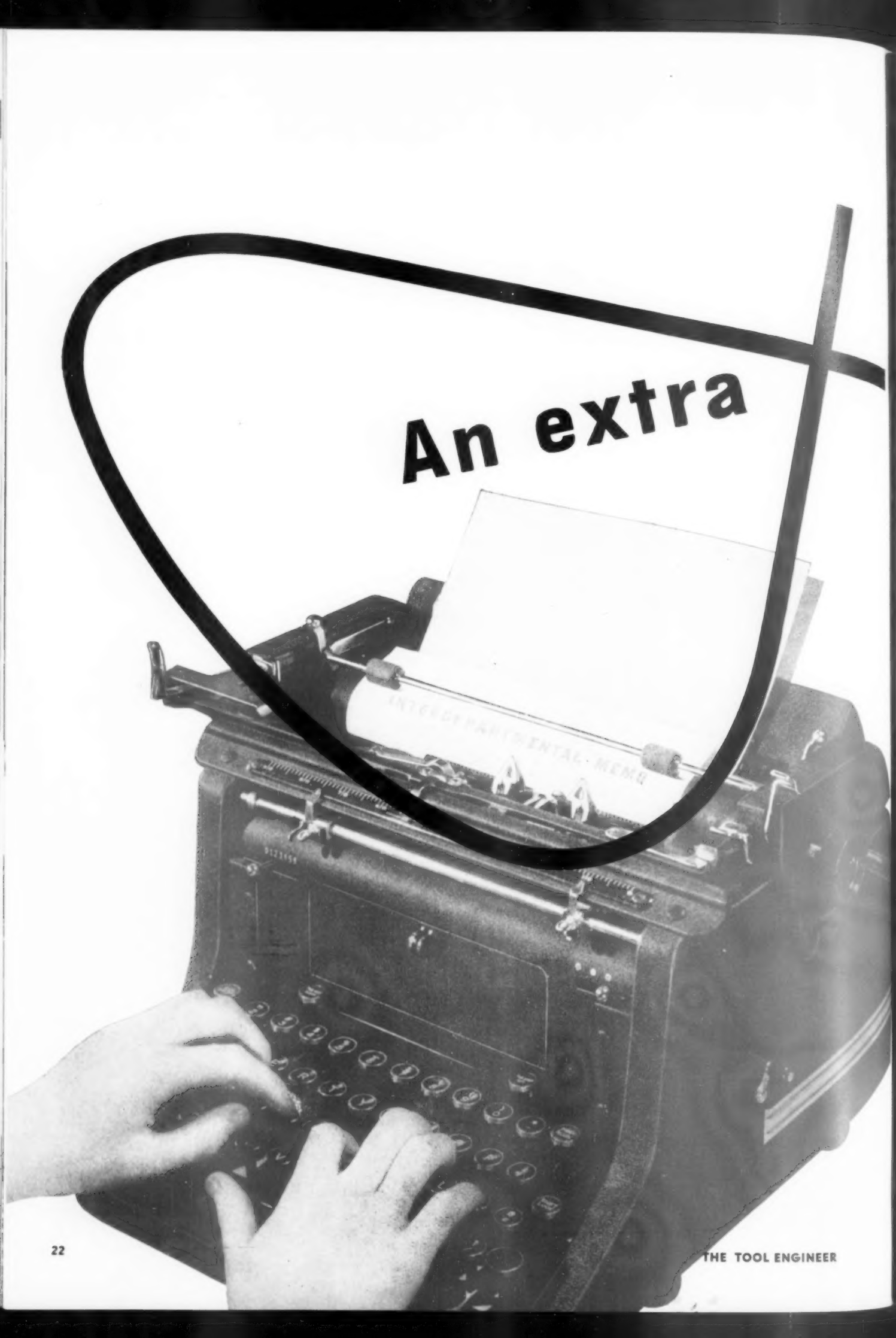
Specially designed for sharpening hobs and formed cutters, this machine insures duplication of original sharpening. Once the set-up is completed, the entire sharpening operation is automatic, relieving the operator for other work. Write for descriptive bulletin F654-5.

BARBER B-C COLMAN PRODUCTS

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

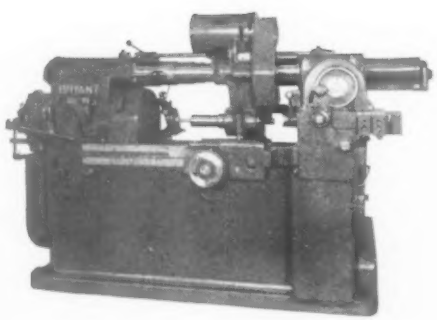
BARBER-COLMAN COMPANY

General Offices and Plant 213 Loomis Street, Rockford, Illinois, U. S. A.


An extra

carbon for Bryant

On memorandums — notes — specifications that cover jobs demanding internal grinding, it is easy to issue standing instructions to make "an extra carbon copy for Bryant."



Right from the earliest stages of development on internal grinding work, Bryant engineers can use this information to study new ways to combine operations, cut costs and save time for you.

Whether your problem is one of urgent, immediate production for defense or far-sighted planning for post-war profits, Bryant engineers are ready to cooperate with your own staff. Bryant productive capacity, already tripled, is constantly increasing. Bryant engineering service is setting the pace on internal grinding today.

The more information you place in the hands of Bryant engineers, the more they can help to push costs down and profits up on internal grinding work for you. Make "an extra carbon for Bryant."

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

2 WAYS TO SPEED UP

with

Aloxite Brand Coated Abrasives

1 *For instance, Aloxite Brand Abrasive Cloth supplied in Economy Rolls, a convenient form for fixture use in lathe lapping operations on main and crank pin bearing surfaces.*

2 *In sheet form Aloxite Brand Cloth is used on all types of hand polishing jobs. Skilled craftsmen always find they can produce remarkably fine results.*

STUDY these pictures. They show two hand methods of using Aloxite Brand Aluminum Oxide Cloth to do a faster and better finishing job. Aloxite Brand Coated Abrasives can be put to work on many operations requiring the removal of stock and the production of smooth surfaces.

There's an Aloxite Brand Coated Abrasive suitable for every kind of finishing job . . . from fine finishing of sheet metal surfaces to the delicate hand polishing of small steel dies. And you can count on these coated abrasives to cut faster, last longer and give the finish required on every job. Ask the Carborundum representative next time he calls.

THE CARBORUNDUM COMPANY

REG. U. S. PAT. OFF.

Niagara Falls, N. Y.

Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids

[Carborundum and Aloxite are registered trade-marks of and indicate manufacture by The Carborundum Company]

ALOXITE BRAND ALUMINUM OXIDE CLOTH

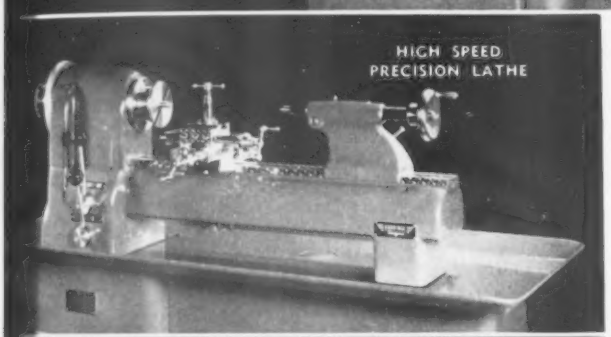
in Sheets and Rolls

Cuts faster lasts longer . . . gives more uniform finish

CARBORUNDUM ABRASIVE PRODUCTS

HARDINGE

HIGH SPEED PRECISION
SECOND OPERATION MACHINE



HIGH SPEED
PRECISION LATHE

HIGH SPEED PRECISION
MILLING MACHINE

PRODUCTION *with* ACCURACY

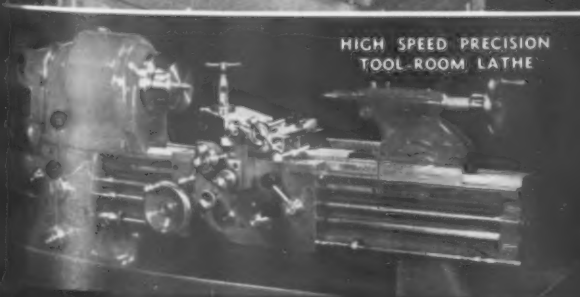
(No. 2 OF A SERIES)

Hardinge Precision Machine Tools combine two important requisites for production—HIGH SPEED and EXTREME ACCURACY. The high speed means greater production and better finish while the extreme accuracy is for the manufacturing standards of today and tomorrow.

The combination of high speed and extreme accuracy in Hardinge machines provides simplicity of operation to enable relatively unskilled operators to produce parts to the necessary close limits without expensive tooling.

Production is not merely quantity. It is a combination of quantity with accuracy to meet requirements for absolute interchangeability in the present system of manufacturing.

To obtain production in quantity with quality, specify Hardinge high speed precision machine tools with the Hardinge preloaded ball bearing spindle construction.



HIGH SPEED PRECISION
TOOL-ROOM LATHE

HARDINGE BROTHERS, INC.

ELMIRA, N. Y.

"Performance has established leadership for Hardinge"

"which type of portable power tool will give me peak production?"

BASIC ADVANTAGES of the Three Types of Portable Power Tools

Available for a wider variety of applications than any other type.

Generally of more rugged construction.

Cannot be damaged by overloading.

Easily stand up under the hardest kinds of heavy duty service.

Run on ordinary AC or DC electric current which is available almost everywhere.

Offer a wide range of models for all kinds of production and maintenance.

Installation costs generally lowest of all.

Lowest operating costs for users of ten or more tools.

Maintain virtually constant speed under load.

Nature of high frequency current permits simplified construction for light weight, easy handling, reduced maintenance.

• Of the three different types of portable power tools — Pneumatic . . . Universal Electric . . . and High Frequency Electric — *one* almost certainly offers decided advantages over the others for *your* particular product and operations.

Which type that is can be determined best by competent study of your particular conditions. *Thor* can give you this competent cooperation because:

Thor makes all three types of portable power tools.

Thor has the engineering "know how" that comes from building good tools for nearly fifty years.

Thor is working continuously to make the good tools of today even better tools tomorrow . . . to develop new tools for new applications.

Thor has the trained Service Engineers to put this advisory service into practical operation.

Before you tool up, get this expert, impartial advice. Plan your application of portable tools *in advance* — and get peak production! For further information, without obligation, write Independent Pneumatic Tool Company, 600 W. Jackson Blvd., Chicago, Illinois.

Thor

PORTABLE TOOLS

PNEUMATIC • UNIVERSAL ELECTRIC • HIGH FREQUENCY ELECTRIC

Let Thor help you get peak production with the right type of Portable Power Tools

•

SAVE TIME
WITH SOUTH BEND LATHES

SPEED

★

ACCURACY

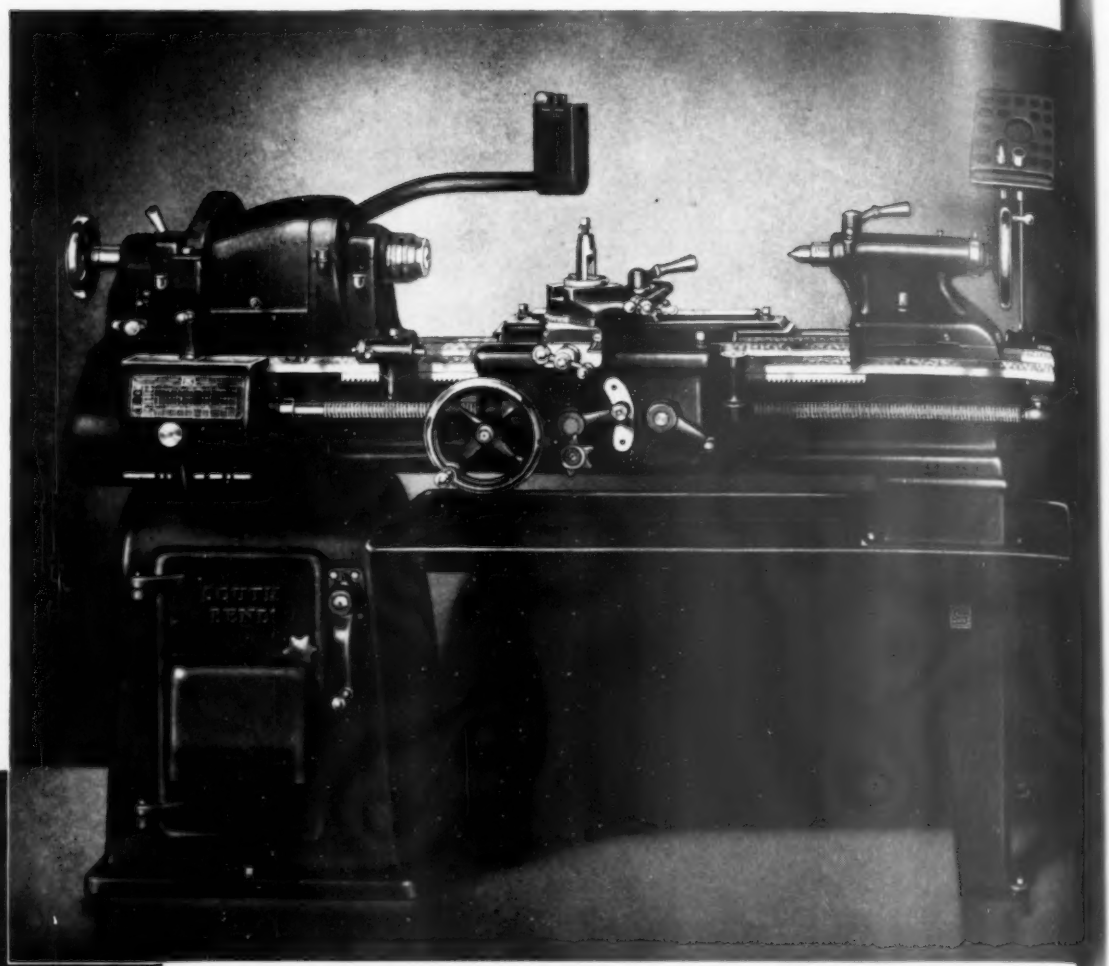
★

EASE OF OPERATION

★

VERSATILITY

★



13" x 5' South Bend Underneath Motor Driven Tool Room Lathe.

TIME is precious these days. The success of our national defense plan depends on maintaining heavy production schedules—there is no time to lose.

When you need increased production, when your tool room is rushed beyond its capacity, you can save time with South Bend Lathes. Their wide range of spindle speeds permits machining work with maximum cutting tool efficiency—their unquestionable accuracy assures uniform precision—their ease of operation reduces fatigue and prevents mistakes—their versatility facilitates quick changeover from one job to another.

South Bend Lathes are made in five sizes, 9", 10", 13", 14½", and 16" swing. All sizes are supplied with tool room or manufacturing equipment. Write for catalog and name of our nearest dealer.

SOUTH BEND LATHE WORKS

922 EAST MADISON STREET, SOUTH BEND, INDIANA, U. S. A.

LATHE BUILDERS FOR THIRTY-FIVE YEARS

LET'S GO! U.S.A. KEEP 'EM FLYING!

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"Get more production" . . . "Make every pound of steel and alloys go as far as possible"—those are your first obligations today. We offer you valuable help in handling alloy steels: both where you use them as materials of fabrication, and where you use them as tools. Don't overlook any opportunity to save time or materials—clip, check and mail the coupon *now*.

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A comprehensive, 128-page book on the properties, uses and best methods of handling, treatment, etc. of tool, stainless and other alloy steels. Plenty of tables to facilitate quick reference. Conveniently pocket-sized.

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AS APPLIED TO LODGE & SHIPLEY No. 3A DUOMATIC LATHE ★ ★ ★

This Lodge and Shipley Duomatic Lathe is set up for rough turning the ogive after nosing operation on 155-mm. shells. The headstock is equipped with a "LOGAN" Model "R" Double Acting Rotating Type Air Cylinder to supply gripping pressure to the "LOGAN" 3-Jaw Compensating Chuck. The tailstock is equipped with a "LOGAN" Model "A" Double Acting Non-Rotating Type Air Cylinder. In addition, this Lodge and Shipley Lathe is equipped with a "LOGAN" Reducing Valve, Lubricator and Pressure Gauge Unit and a "LOGAN" Model "H" Foot Control Valve. This "LOGAN" Air Equipment provides rapid, positive action and rigid support of the work. "LOGAN" Representatives and "LOGAN" Engineers will be glad to make recommendations on your problems.

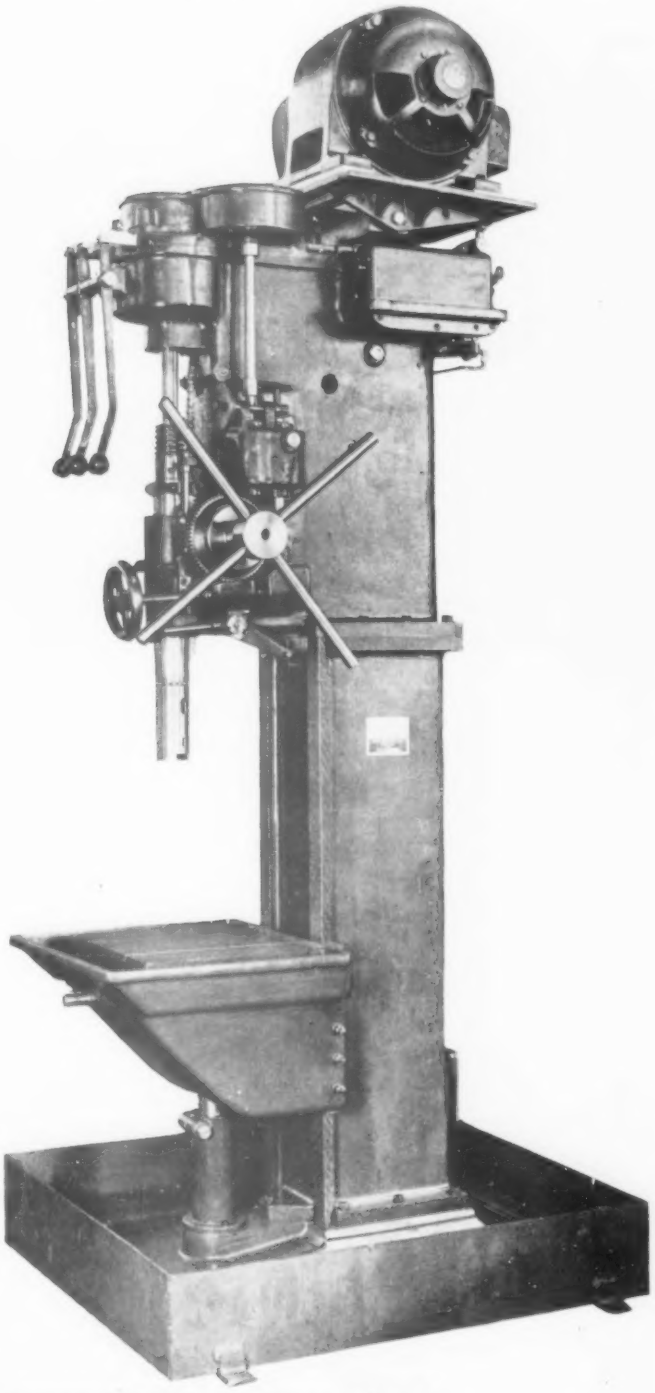
★ **LOGANSPORT MACHINE, INCORPORATED** ★
902 PAYSON ROAD
LOGANSPORT, INDIANA
Manufacturers of Air and Hydraulic Devices, Chucks, Cylinders, Valves, Presses and Accessories

BAKER DRILLS

BOX COLUMN HEAVY DUTY TYPE

WIDE SPEED AND FEED RANGES

ADAPTED TO THE ARMAMENT PROGRAM



Replacing the well-known Model No. 121, Baker Brothers introduce a Universal Quick Change Type Heavy Duty Drill, Model No. 150. The general specifications are the same as No. 121, with the added feature of a wider speed range and twelve instantaneous quick changes of speed.

This same capacity machine is also built as a Single Purpose Type Machine with speeds secured only through means of pick-off gears. The same design is applied to the feed train where the pick-off gears are furnished for changing of feeds. Brand new circular material is available on both types of machines. Write for your copy today.

- **Multi-Vee Belt Drive**
- **Multi-Splined Spindle Drive**
- **Two-Piece Frame Design**
- **Capacity: 1½ inch Diameter Drill In Solid Steel**

A Very Flexible Machine For General Purpose Operations!

WRITE FOR NEW CIRCULAR AND ENGINEERING DATA SHEET

BAKER BROTHERS, INC. TOLEDO, OHIO, U. S. A.

DRILLING - BORING - TAPPING - KEYSEATING - CONTOUR GRINDING MACHINES

Machines and cutting tools – this is industry's crack combat team. Only with first quality tools can you show significant results in war production!

MORSE

THERE *IS* A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY

NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.

Conversion TO WAR PRODUCTION CALLS FOR MORE INFORMATION ABOUT ALLOYS...

Conversion to war production makes great demands upon both plants and personnel. While altering plant layouts, experienced employees must be taught correct methods of handling new operations on different metals. New employees must be trained...and taught to avoid waste and spoilage of critical materials.

You can *quickly* obtain practical answers to questions about the selection, fabrication and uses of ferrous and non-ferrous alloys containing Nickel by asking us. We have on hand a fund of information collected through years of research, field studies and experiences of alloy users.

This data has been checked and edited into convenient charts and pamphlets. These printed pieces range from technical data for engineers to simplified guides for apprentices.

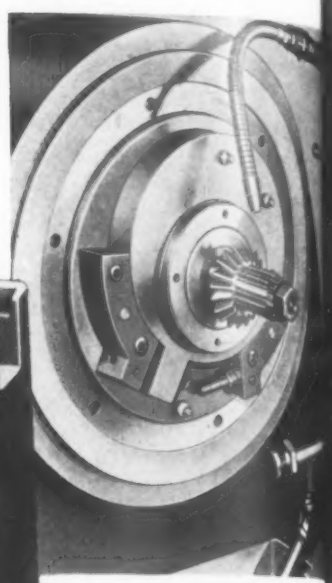
Now...with minutes and materials so vital to Victory...make full use of this metal-working experience. Our technical staff also offers personal assistance in overcoming problems created when Nickel was allotted to places where it serves the Nation best.

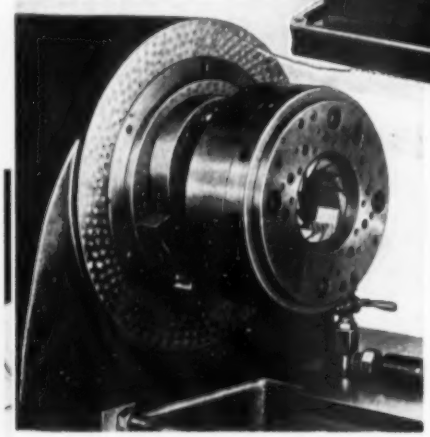
★ ★ *Nickel* ★ ★

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK, N. Y.

PRODUCE PRECISION
Internal or External
THREADS . . . FASTER!

Below is shown set up for internal threading, the milling hob is revolved eccentrically about the work and simultaneously rotated into the work for the full depth of the thread. The cutter then rotates on its own axis and is carried around the work and simultaneously advanced by means of a lead screw to produce the desired helical thread.





Above is shown the spindle nose equipped with a hardened and ground 12-cutter thread milling head for cutting external threads from 1" up to and including 4" in diameter. The same eccentric milling action is employed as in the cutting of internal threads described above.

with the

NEW MURCHEY No. 32 THREAD MILLING MACHINE

Featuring a unique eccentric milling action described above, the new Murchey Thread Milling Machine is setting new records for speed and precision in the production of munitions threads. For example, on one job it is cutting a 2 7/16" thread in the base end of anti-aircraft shells faster than one a minute! Internal or external threads from 1" to 4" in diameter and up to 3" in length can be threaded right up to a shoulder if necessary. Maximum efficiency in operation is obtained through the completely hydraulic work cycle and the Reeves variable speed drive which permit the selection of exactly the right speed and feed for every job. And in the cutting of deep, coarse threads, the heavy box-type bed and the keyway in the fixture table help to maintain rigidity and perfect alignment. If you are looking for increased speed and maximum accuracy in munitions and aircraft threading, let us send you further details of the latest Murchey thread production equipment.

We also manufacture all types of Collapsible Taps, Self-Opening Die Heads, Bolt and Pipe Threading Machines and Pipe Cutting-Off Machines.

THE MURCHEY MACHINE & TOOL COMPANY
951 PORTER STREET, DETROIT, MICHIGAN


TAPPERS
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Jarvis
POWER TOOLS
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TAPPERS
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THE CHARLES L. JARVIS COMPANY
TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES
Middletown, Conn.

NATCO High Speed Sensitive

MODELS G-5 AND G-6

The NATCO Models G-5 and G-6 are of similar design, and vary only with regard to the size of the drilling area of the head, horsepower of head drive motor, number of spindles in the head and size of work table. These machines handle a wide range of small and medium size, multiple drilling or tapping work at a minimum cost.

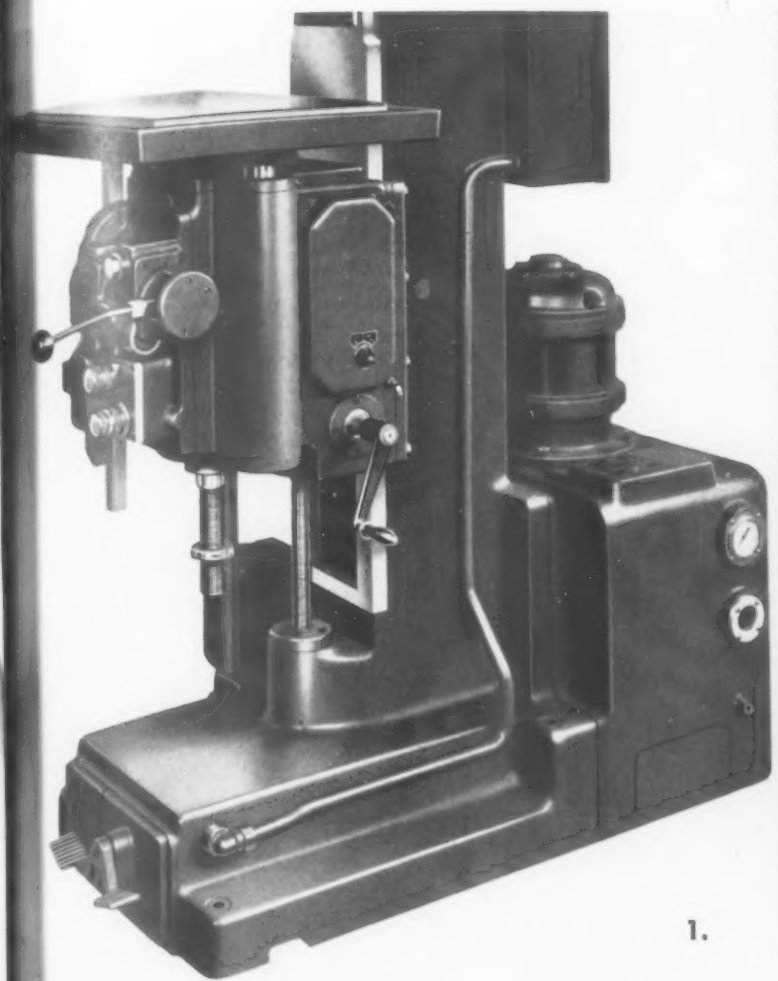
These machines may be furnished as a Driller only, as a Tapper only, or as a combination Driller and Tapper. They are provided with change gears and a quick change speed mechanism for correct spindle speeds . . . vertical adjustment on the spindles and floating tap holders. They are equipped with a reversing motor drive which eliminates all belts and clutches for Tapping operations.

A large table has been provided which may be arranged with a combination hand and foot feed, as shown above left, or a hydraulic power-operated feed, as above right.

NATIONAL AUTOMATIC TOOL COMPANY, INC

Multi-Driller or Tapper

Models G-5 and G-6



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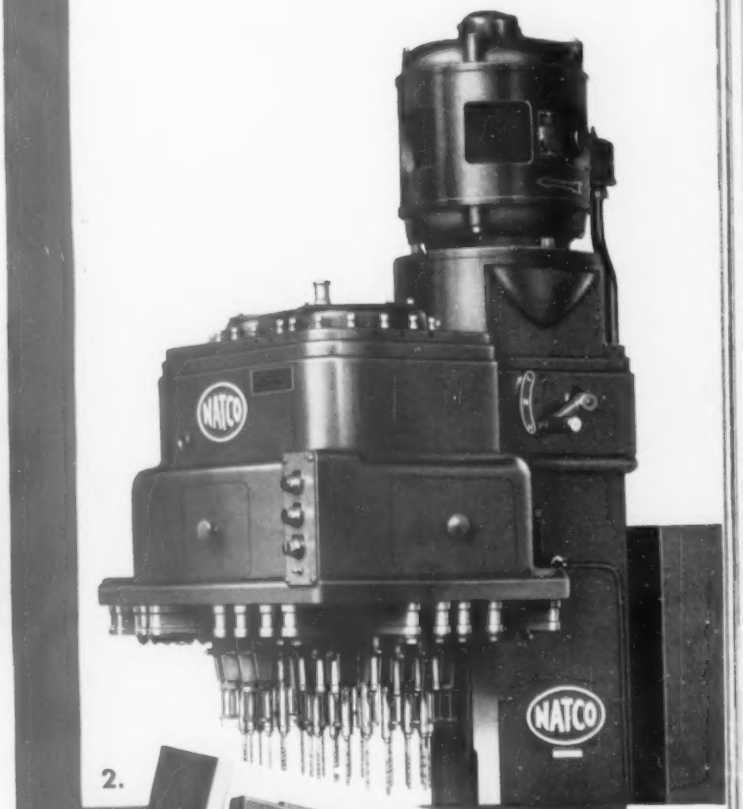

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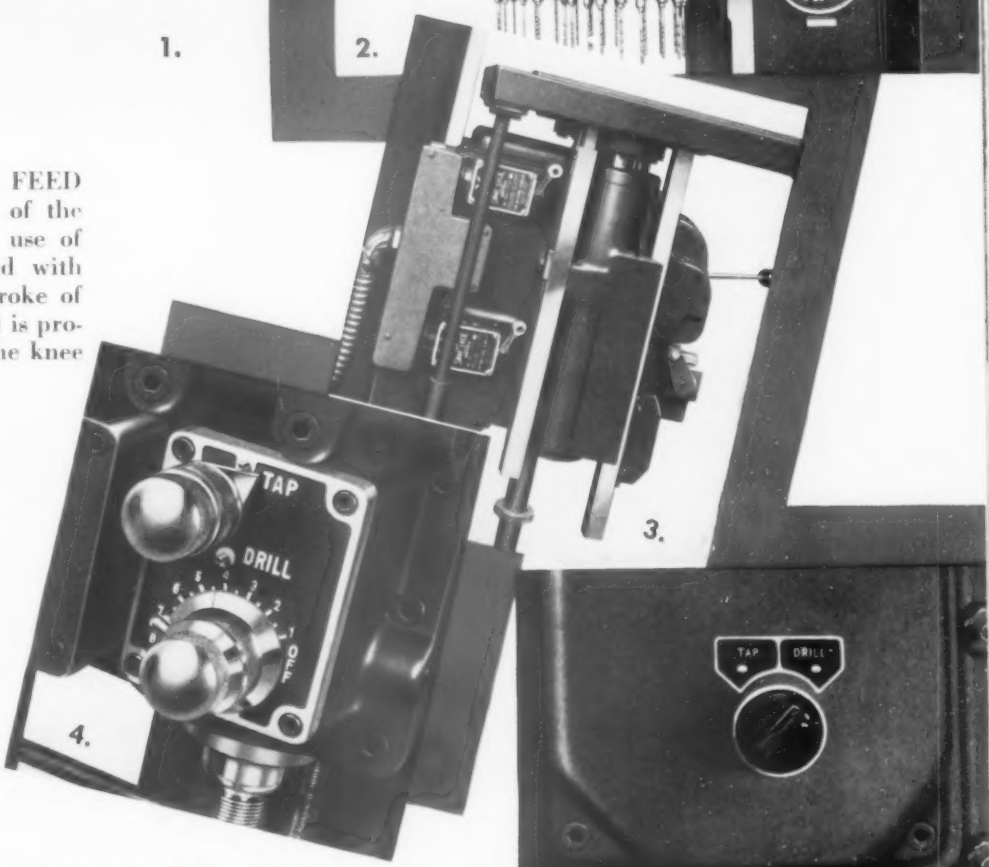

3.

4.

5.

Illustration No. 1 shows the HYDRAULIC FEED TABLE AND KNEE. Accurate alignment of the table with the knee is obtained thru the use of two heavy guide bars. The table arranged with hydraulic feed has a maximum feeding stroke of 5". The knee is carried on column ways and is provided with a vertical adjustment of 10". The knee is adjusted thru an elevating mechanism operated thru a crank and bevel gears.

Illustration No. 2 shows a NATCO Model G-6 arranged with a 10 x 24" drilling area head with twenty-four ¾" diameter spindles.

Illustration No. 3 shows the dogs which control the length of rapid traverse and feeding stroke. Also the limit switch which controls the point of tap reversal, and the limit switch which again reverses the motor to the bottom of the table cycle.

Illustration No. 4 shows the Hydraulic Panel on the front of the table knee. The upper knob is used to set the hydraulic valve for either a drilling or tapping cycle, and the lower knob is used to set the aperture or feed rate valve as required.

Illustration No. 5 shows the Transfer switch used to change the electrical circuits for either a drilling or tapping cycle.

WRITE FOR CIRCULAR NUMBER 522

NATCO

RICHMOND INDIANA U S A

SOME USERS OF TURNER UNI-DRIVE

•

American Brake Shoe & F. Co.
Kellogg Division
Southern Wheel Division
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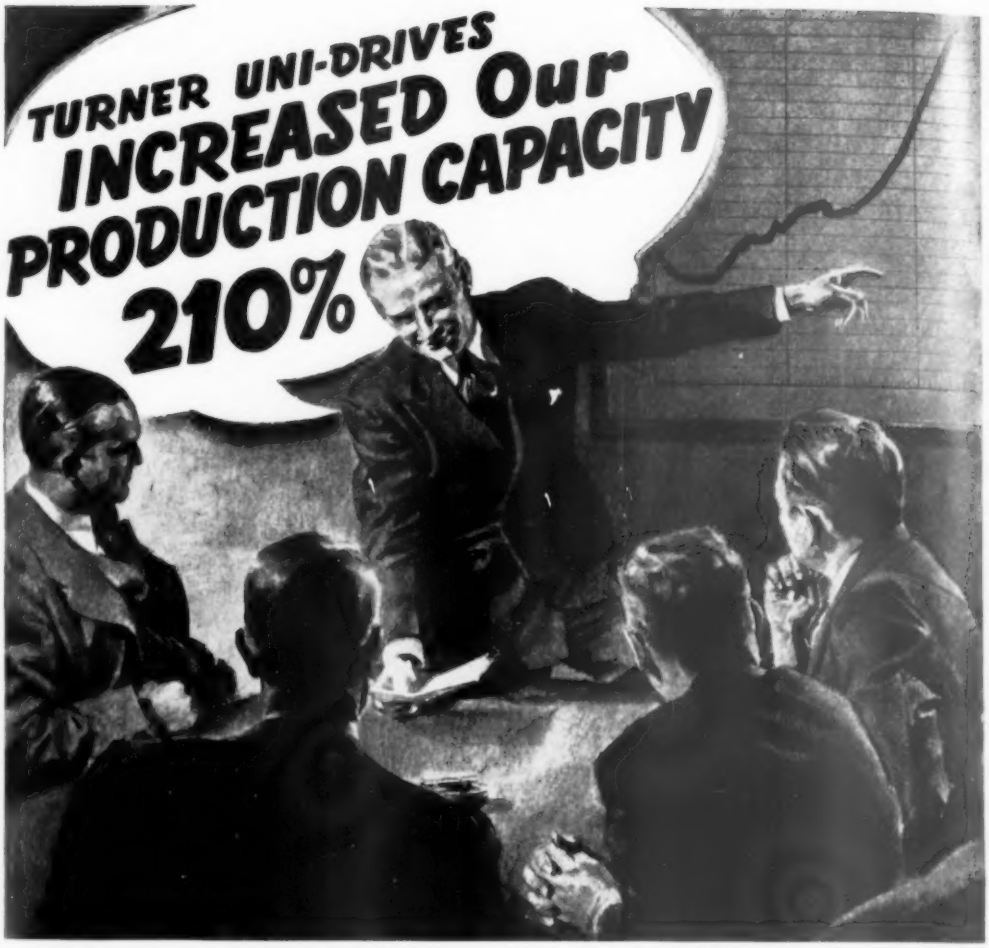
Thos. A. Edison Co.
The Timken-Detroit Axle Co.
Toledo Scale Co.
The Todd Company
Wabash Railway Co.
Wagner Electric Co.



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FROM COAST TO COAST TURNER UNI-DRIVE HAS PROVED TO BE THE SUCCESSFUL ONE-MOTOR DRIVE

Today, more than ever before, time is money. Production and *more* production is the demand. TURNER UNI-DRIVE is the answer. In hundreds of shops and plants this motorizing unit with selective sliding gear transmission is speeding production up 50% to 300%. It will do a good job for you!

Consider these features of UNI-DRIVE: Easily and quickly installed... 2 to 4 hours. No belts to shift. Big saving in power. More spindle speeds. Increased efficiency of machine and operator. Eliminates overhead countershafts. Drives on large cone at all speeds. Guaranteed for one full year. Furnished in various sizes to meet practically every need.

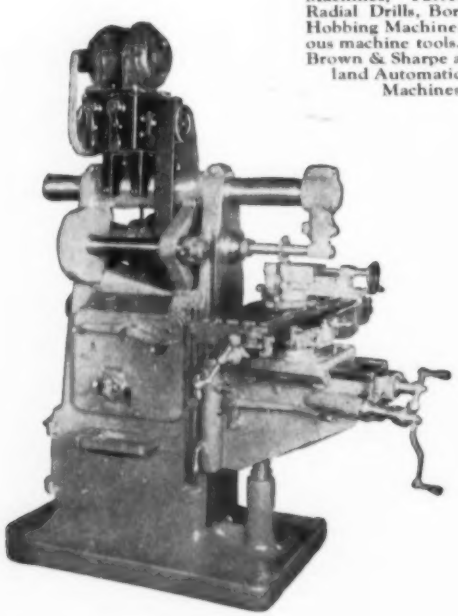
Your first installation will prove to you a score of other time-and-money-saving advantages of TURNER UNI-DRIVE.

Don't put it off longer...see your dealer today or write for full information and prices.

THE TURNER UNI-DRIVE COMPANY
(Sales Division: Turner Machinery Co.)
3416 Terrace St. **Kansas City, Mo.**

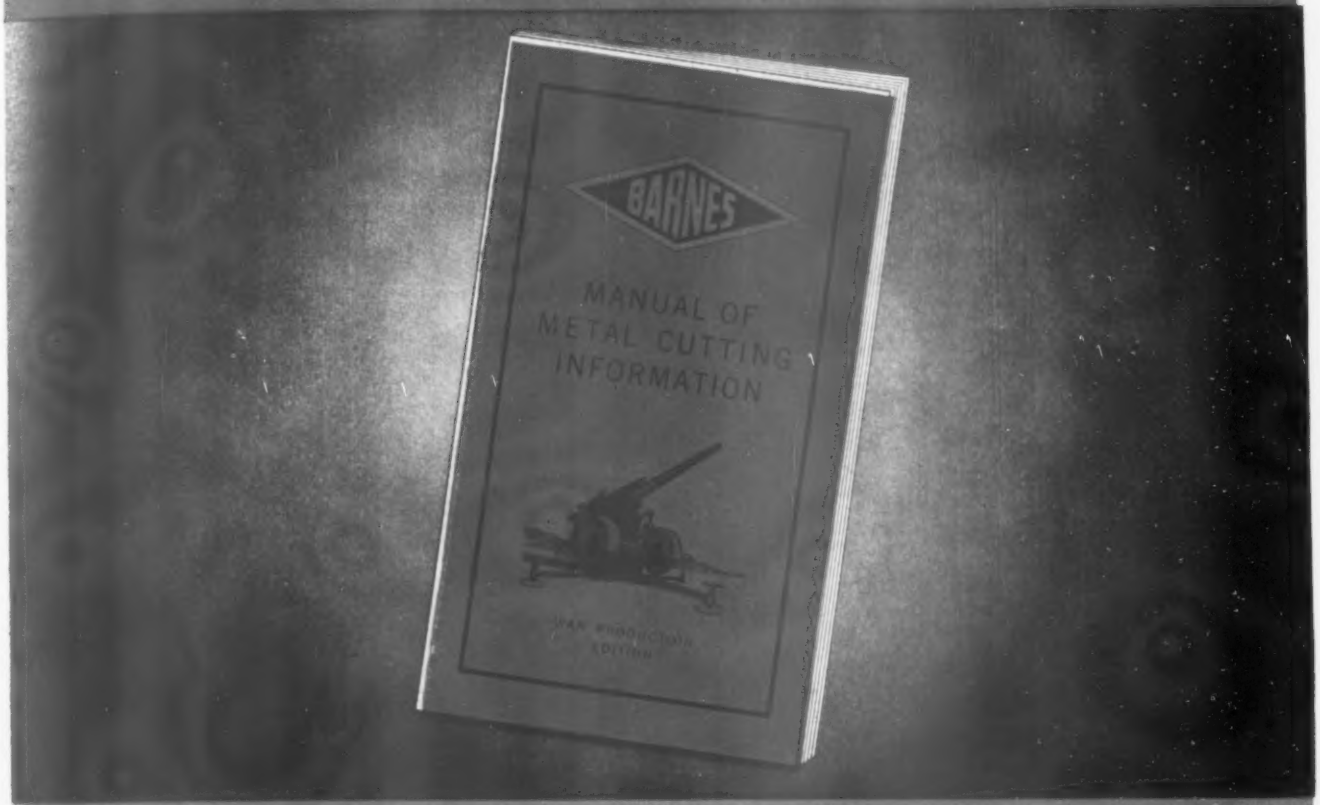
IT DOES THE JOB

on Lathes, Shapers, Milling Machines, Turret Lathes, Radial Drills, Boring Mills, Hobbing Machines and various machine tools. Also for Brown & Sharpe and Cleveland Automatic Screw Machines.



TURNER
UNI-DRIVE
Motorizes Machine Tools

A Manual of



Metal Cutting Information

Free

Make your Barnes hack saw blades and band saws do more work! There are many little details of correct operation that will help you get more and better production — will reduce machine "down time" due to blade changes.

This booklet (now in its Seventh Edition) tells you not only how to select saws but how to use them to the best advantage. Ask your Barnes dealer for a copy—or write us.

W. O. BARNES CO. INC.
DETROIT MICHIGAN

Manufacturers of Hack Saw Blades and Metal Cutting Band Saws, sold only through Mill Supply Distributors. And remember that today, as always, the Mill Supply Distributor is at the other end of your local telephone, ready to deliver what you need or search the country to get it for you.

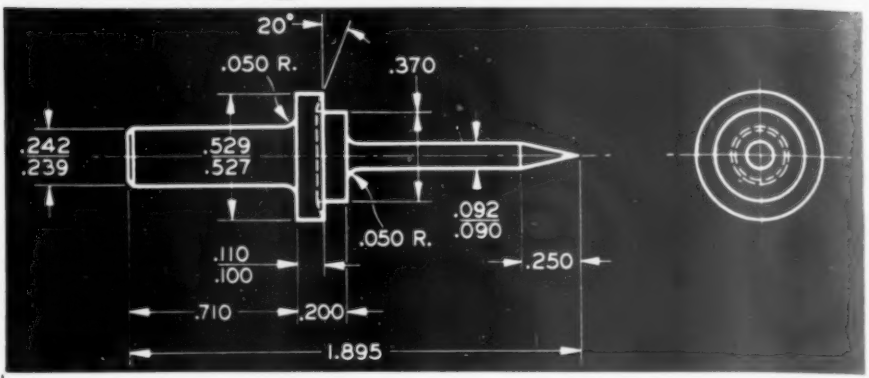
Greenlee

AUTOMATIC NEWS

PREPARED BY GREENLEE BROS. & CO., ROCKFORD, ILL.

Efficient Tooling Speeds Output of Striker Pins

Greenlee 1″ Automatic Turns Out 276 Pins Per Hour



Typical of the accuracy and speed with which Greenlee Automatic Screw Machines are turning out hundreds of vital defense parts in the United States, England, and Canada, is this story of the production of an English type fuse striker pin on a 1″ six-spindle Greenlee machine.

This job is an excellent example of how the versatility and tooling possibilities of the modern screw machine can be easily adapted to solve many of today's perplexing production problems.

Tooling for Production Efficiency

To eliminate the possibility of difficulty in forming the pointed end of this part, a small box-type roller turner is used instead of the conventional heavy standard roller turner. With this box-type turner, two tools are used, one for turning the small diameter and one for profile turning the point. The one set of rolls in this turner is sufficient to support the piece during these operations.

Another interesting feature of the tooling set-up for this job is the use of a hollow milling tool for undercutting the shoulder which eliminates the need for a special angular cross-working tool.

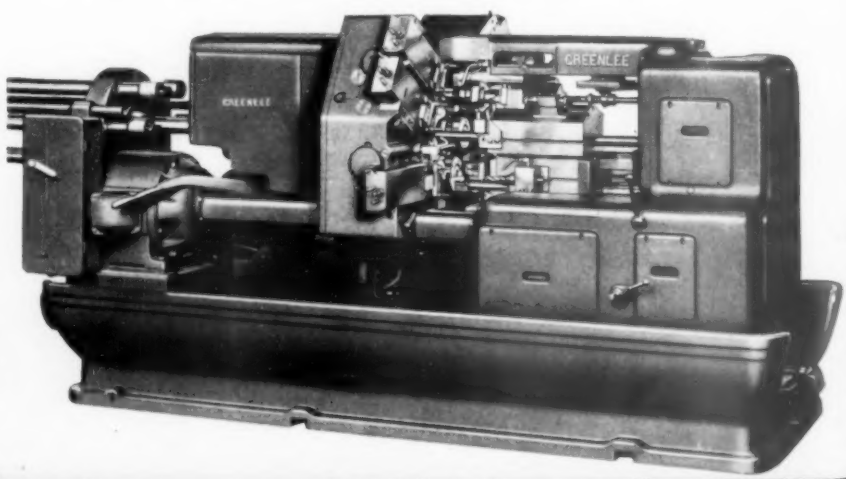
The use of a standard roller turner to finish turn the small .092/.090 diameter probably would result in objectional back-track marks when withdrawing the tool at the end of the cut. It is necessary, therefore, to use another unusual tooling arrangement. A standard die head, operated by a yoke which snaps open the die head at the finish of the cut, is equipped with specially ground chasers to finish-turn this piece.

Production Time Cycle 13 Seconds

The production time cycle for this fuse striker pin, made from $\frac{9}{16}$″ round S.A.E. 1112 cold-rolled bars, is 13 seconds. The spindle speed is 1195 R.P.M., the form tool feeds are .0008″ per revolution, with a cut-off feed of .0012″ per revolution for the independently operated cross slides. Turning and endwise-operated tools were fed at .0048″ per revolution.

Sequence of Operations

In the first position the .092/.090 diameter and the point is rough turned with the standard roller turner. In the second position the flange diameter was knee turned and the .092/.090 diameter and point were semi-finished turned with a box type roller turner. In the third position the .242/.239 and the .529/.527 diameters were formed, and the shoulder was undercut with a hollow milling tool. In the fourth position, the .370 diameter is faced, the .050 radius is formed, and the striker point is finished, using roller supports ahead of the finish profile turning tools. The .092/.090 diameter is finish turned with the specially arranged die head in the fifth position. The piece is then cut off in the sixth position.



Greenlee BROS. & CO.

ROCKFORD ILLINOIS U.S.A.

MULTIPLE-SPINDLE DRILLING, BORING, AND TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AIRCRAFT PRODUCTION MACHINERY

to the Safety of Sky Riders

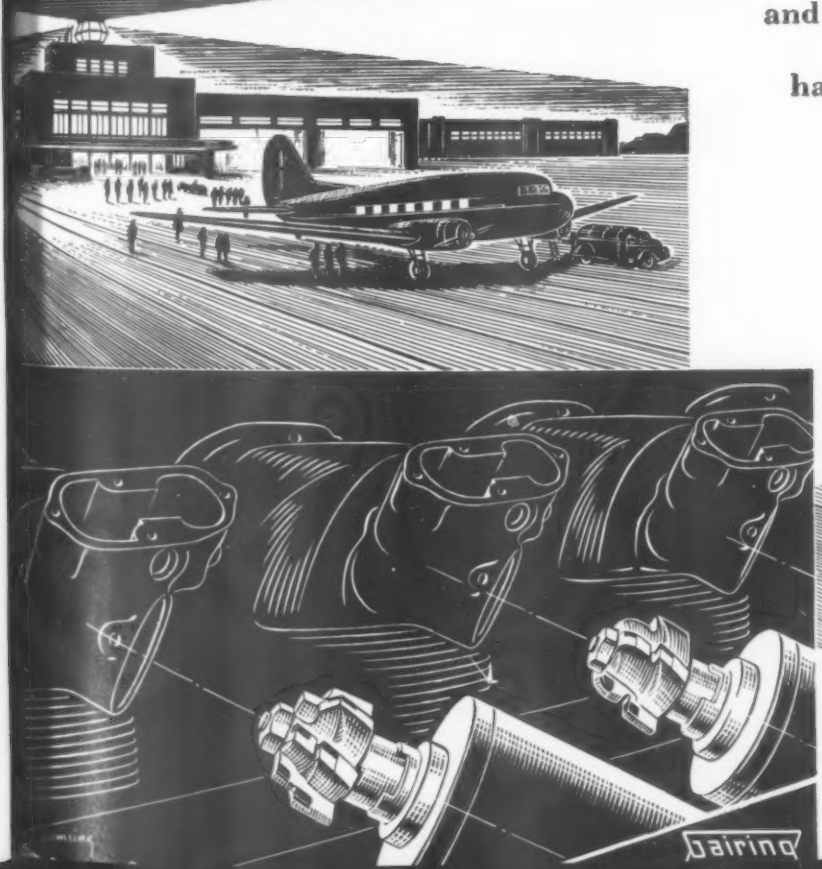
In War or Peace, in foul weather or fair, the safety of those who ride the sky fleets of the world is dependent upon the power, speed and accuracy of the vital parts of their craft.

In the plants of aircraft, engine and parts manufacturers, you'll find Gairing Cutting Tools on multiple shift schedules, assuring accuracy that saves vital seconds in the grim race against time.

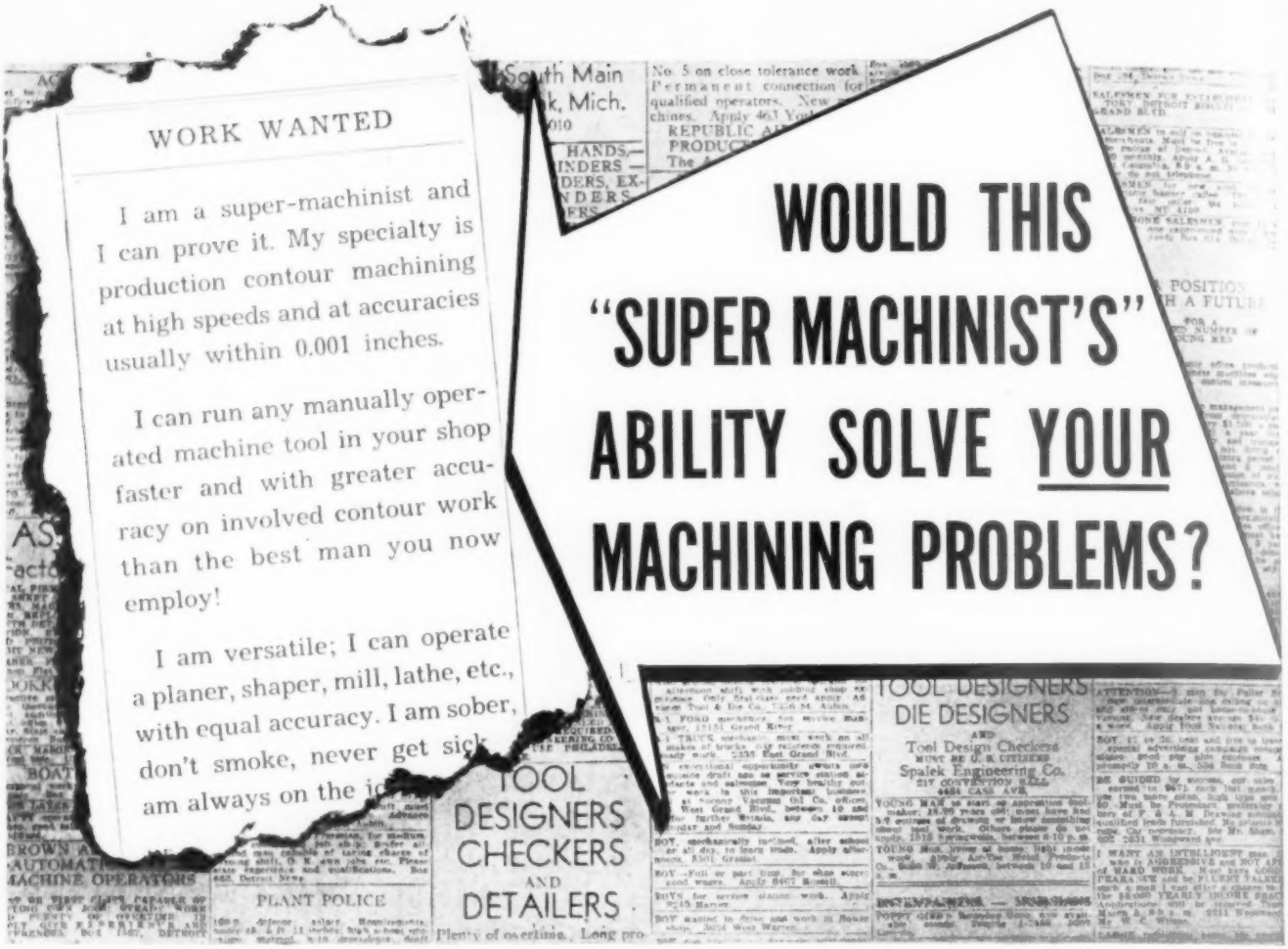
Standard tools, special tools for handling unusual specifications, and Gair-Lock inserted blade cutters— their design and manufacture have been our contribution to Industry for a quarter of a century.

THE GAIRING TOOL COMPANY
Detroit, Michigan

GAIRING
FOR A QUARTER CENTURY SPECIALISTS IN FINE CUTTING TOOLS



Close-up of Gairing Cutting Tools rough boring, cutting radii and face, finish boring and chamfering intake port faces in rear cylinder heads of aircraft engines.



This *super-machinist* is a **DUPLIMATIC!** It is to be used with your present equipment—same machines, same operators.

DUPLIMATIC gives you faster production contour machining at accuracies required in this war. It is quickly connected with the feed screws of the machine it is to control. It duplicates an original pattern or template directly and *semi-automatically* in metal at high speeds and at uncommon accuracies.

This precision control directs the movement of any manually controlled machining operation: milling, turning, planing, shaping, boring, die sinking.

DUPLIMATICS are foolproof in operation. Operators "catch-on" quickly. Maintenance is no problem.

If you have production machining that must be done on your present manually controlled equipment and yet should be done at speeds and at accuracies considerably beyond human capacity, tell us about it.

DETROIT UNIVERSAL DUPLICATOR COMPANY
216 ST. AUBIN ST., DETROIT, MICHIGAN, Telephone: Fitzroy 2200

These are sketches of the simplest and most typical

DETROIT UNIVERSAL DUPLICATOR COMPANY

types of work now being handled by DUPLIMATICS.

New INSTRUCTIVE BULLETIN ON BROACHES

"Illinois Engineers" have prepared a highly interesting bulletin on *The Elements of Broach Design*. It provides much helpful information for tool designers as indicated by the following partial summary of its contents:

1. Definition of chip capacity
2. Chip size
3. Selection of tooth spacing
4. Selection of thickness of cut
5. Determining overall broach length
6. Cutting angles—both hook angle and back clearance
7. Cutting force and strength of broaches and their relationship

This bulletin is part of the "Illinois Technical Data Series" which is being developed and offered to tool users as a constructive effort in solving vital production problems. To receive this broach bulletin and announcements regarding future releases, send a request on your company letterhead—write today!

ILLINOIS

High Speed Production Tools

Hobs • Broaches • Shaper Cutters
Milling Cutters
Ground Form Tools • Special Tools

★ ★ ★

Gear Measuring Machines
Gear Measuring Blocks
Die Filing Machines

ILLINOIS TOOL WORKS

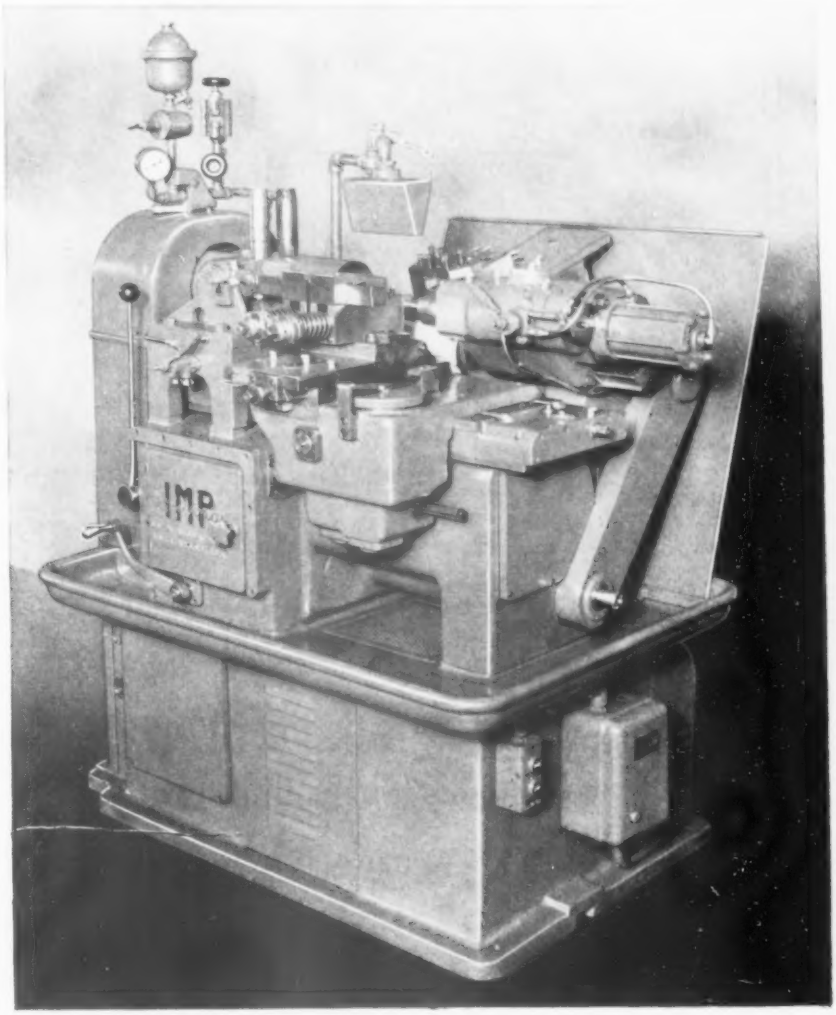
MANUFACTURERS OF METAL CUTTING TOOLS AND SHAKEPROOF PRODUCTS

2501 N. Keeler Avenue, Chicago, Illinois

MACHINE OF THE MONTH

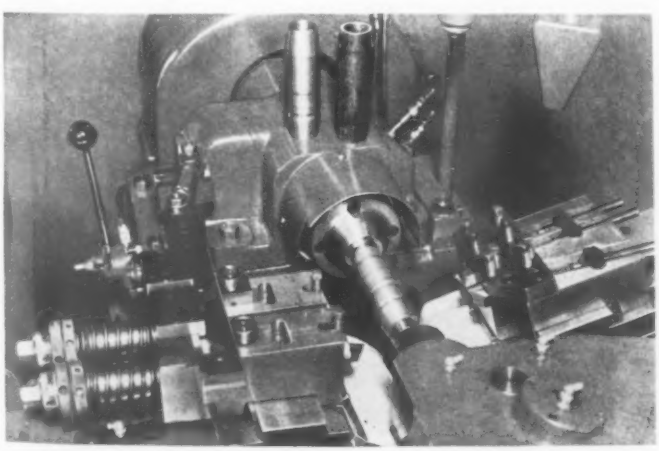
PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK

Lo-swing IMP LATHE FINISH TURNS 40 MM SHELL IN ONE OPERATION



PROBLEM: To finish turn 40 mm high explosive shells, approximately 1.57″ diameter x 5.17″ long, maintaining close concentricity between O D and bore and obtaining an accurate, high-class finish.

SOLUTION: The Automatic Lo-swing IMP Lathe was chosen for this work because its spindle construction with direct "V" belt drive permits turning with sintered carbide tools at the very high surface cutting speeds necessary to assure a polished finish.



Close-up of tooling with covers removed on template-controlled tool blocks to show construction. Note rough and finish turned pieces on headstock. Work is first drilled, reamed and ends rough bevelled on an 8-spindle automatic lathe before coming to the IMP.

Also, other features of IMP design assured the rigidity and turning accuracy which this job demanded.

The work is held and driven at the head end by an air-operated expanding collet chuck. The tailstock end is supported by a revolving, expanding bushing which enters the small diameter bore. The O D is turned the full length of the piece with 2 template-controlled tool blocks — finish turning the nose, the boat tail and the cylindrical body. Simultaneously, a 3-tool block on the automatic back squaring attachment faces and chamfers one end and machines the cartridge crimping groove.

Movements of both front and rear slides are synchronized and the machine stops automatically with tools and slides returned to starting position. The tailstock is air-operated to speed-up handling time.

TOOLS

ARE NEEDED TO WIN THE WAR

☆ ☆ ☆ ☆

That is the reason why our production of Davis Boring Tools is now Uncle Sam's "for the duration."

We know that all of you regular customers of ours appreciate the situation, and are with us heart and soul in this unified, *all-out* effort to win. *And win America will.*

Thanks for the fine spirit of patience and cooperation you have shown us during the past year. One of these days we will be able to repay by again giving you the kind of service which you deserve.

DAVIS BORING TOOL DIVISION

Larkin Packer Co., Inc. • St. Louis, U. S. A.

The whirring of pulleys and belts . . . the meshing of gears . . . the hum of mechanical power producing war material on an unparalleled scale . . . in practically every factory in the United States . . . 'round all the hours of the clock—

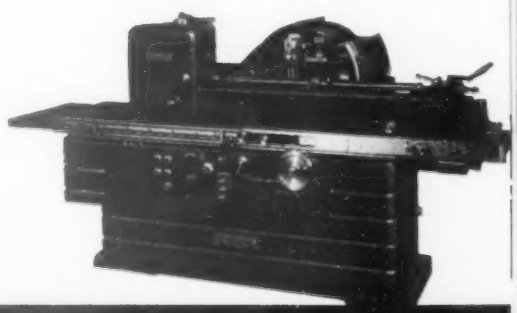
—this is the real battle cry of American industry . . . employees and employers together . . . as it lines up on the vast production front—

—a sure sound of Victory!

It has long been the predominant sound in all of the plants of Ex-Cell-O Corporation, where, day and night, thousands of skilled workers . . . loyal soldiers in overalls . . . are producing precision machine tools, cutting tools, precision-made parts, all in aid of this country's vital war effort.

EX-CELL-O CORPORATION • DETROIT

Below: Ex-Cell-O Precision Thread Grinder—Style 35-L . . . one of nine standard machines being widely used to produce highly accurate threads on hardened metal parts for the aircraft and other industries.



XLO

EX-CELL-O *means* PRECISION

Precision THREAD GRINDING, BORING AND LAPPING MACHINES, TOOL GRINDERS, HYDRAULIC POWER UNITS, GRINDING SPINDLES, BROACHES, CUTTING TOOLS, DRILL JIG BUSHINGS, PARTS

Portable Electric Tools are made of Critical Materials

DO NOT Use Them Carelessly

TRADE STANLEY MARK

A glance at the ingredients of a portable electric tool shows why you should use the tools you have carefully.

Stanley Portable Electric Tools are in tremendous demand. Unless you are engaged in war production work, you may find it difficult to replace the ones you have. If some part wears out, don't throw away the tool – have it repaired or rebuilt.

We shall do everything possible to continue to furnish repair service and replacement parts for all Stanley Electric Tools. Stanley Electric Tool Division, The Stanley Works, New Britain, Connecticut.

STANLEY Electric Tools

Gages *for* INSPECTION

SEE if it's right at once. Later, is too late. These gages have proven their ability to show you what is right or wrong at once — and positively.

There's hardly a dimension you must finish your work to, but what you can inspect with greater speed and surety with Federal Dial Indicator Gages.

The snap gages don't wait for you to "feel" — they show you at once. The pitch diameter gage is good for British threads as well as U. S., and it is accurate to .0002". It i decidedly new and decidedly suited for precision thre The shell gages are faster and decided improvement earlier models. New designs are available for th of war material inspection jobs. Tell us wha you need.

FEDERAL PRODUCTS CORPORATION
1144 Eddy Street Providence, R. I.

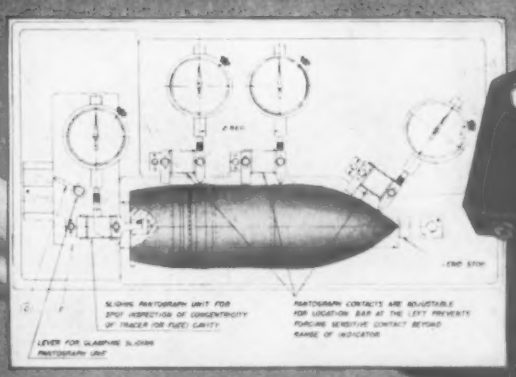
SNAP

PITCH DI

SHELLS & BOMBS

SHELLS

PLUG



FEDERAL

PRECISION MEASURING INSTRUMENTS

Chicago • Cleveland • Detroit • Hartford • Los Angeles • Milwaukee • Montreal • Muncie
New York • Philadelphia • Pittsburgh • Rochester • San Francisco • St. Louis • Toledo • Toronto • Windsor

A Compact Streamlined BENCH-TYPE Drill Grinder

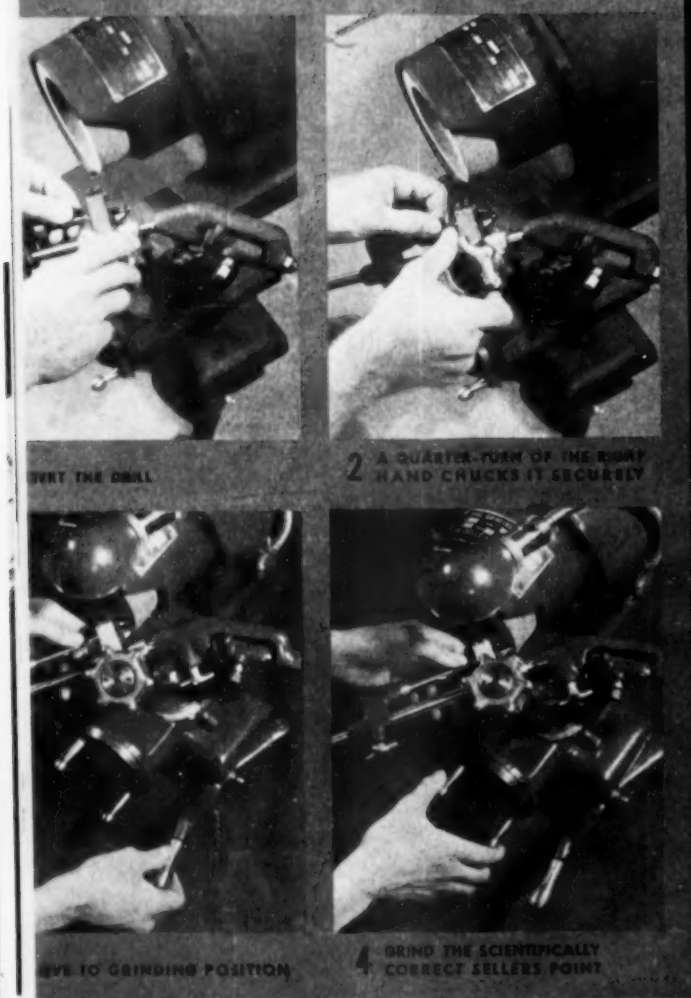
—a genuine SELLERS grinder

HERE is a small, practical, bench-type drill grinder that embodies the basic principles and the inherent accuracy of the Sellers chuck and the Sellers method of drill grinding. This self-contained machine produces the famous Sellers drill point on one or a million drills in sizes as small as .028" (#70) and up to ½" diameter. It provides drill lips ground with the same inclination to the drill's axis, of equal length and with proper clearance at both center and periphery—the secret of the efficiency of the Sellers drill point.

Pedestal Cabinet for 1-G Drill Grinder

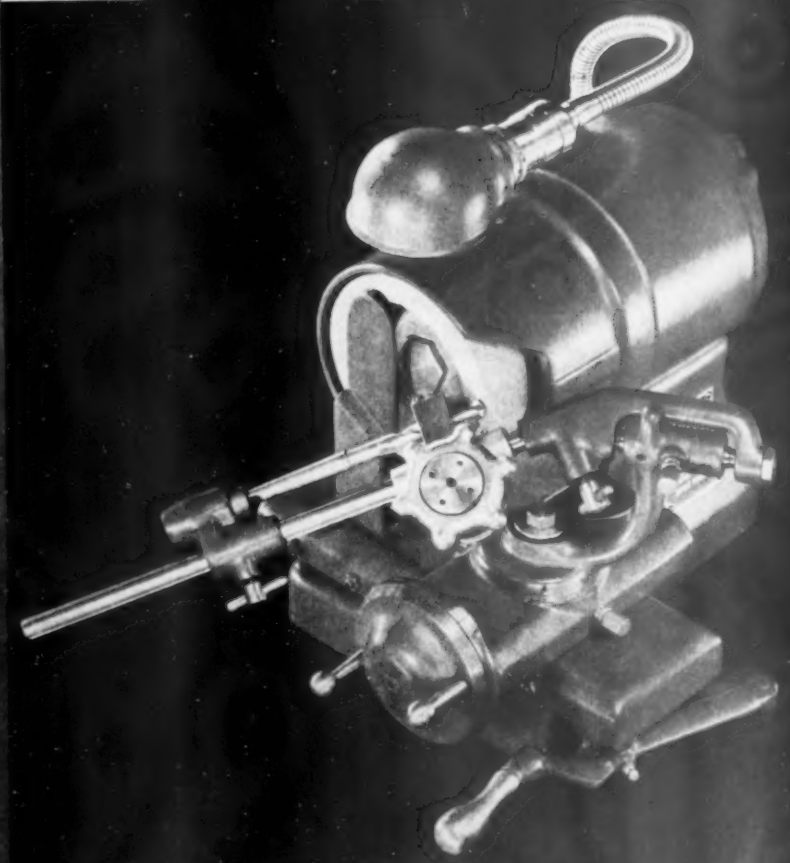
Write for Bulletin on Sellers 1-G Drill Grinder

WILLIAM SELLERS & CO., INCORPORATED
1600 Hamilton Street Philadelphia, Pa.



2 A QUARTER-TURN OF THE RIGHT HAND CHUCKS IT SECURELY

4 GRIND THE SCIENTIFICALLY CORRECT SELLERS POINT



MODEL 1-G

FOUNDED SELLERS 1848

Sellers

THE TURRETS SPEAK *louder than words!*

The heat's on! The defense industries have called for action—for faster machining of thousands of parts used in tanks, planes, ships, and other critical equipment.

There's no need to explain how well these modern machine tools are answering the call. The new Gisholt Turret Lathes are speaking for themselves—saying it with production which far outstrips all previous standards for speed, accuracy, and low cost.

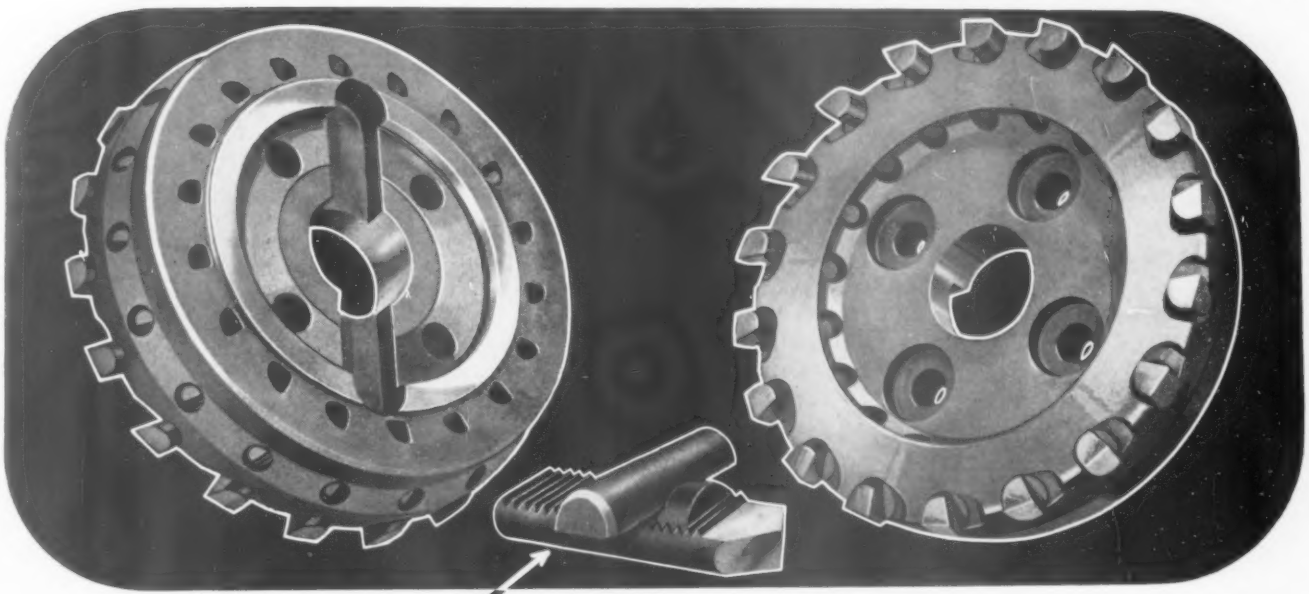
Look ahead . . . keep ahead . . . with Gisholt improvements in metal turning

GISHOLT MACHINE COMPANY

1229 EAST WASHINGTON AVENUE • MADISON, WISCONSIN

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

Get more out of your present Milling Machines with LOVEJOY TYPE "A" MILLING CUTTERS



with Positive Locking Blades

No milling machine should be handicapped with obsolete or inefficient milling cutters — especially at a time like this. Now is the time to make every machine count.

Lovejoy Type "A" Milling Cutters *with positive locking blades* will improve the accuracy and output of old machines that *must* remain in service, and keep new machines at the peak of efficiency.

Type "A" Mills are designed for heavy duty work and all general face milling jobs. They require the least amount of power on coarse feeds at high speeds. Not only do they require *a minimum of down-time* for sharpening, but *more than one-half the blade can be utilized.*

When orders call for increased production from your milling machines, be sure to call for Lovejoy Milling Cutters.

LOVEJOY
TOOL COMPANY Inc.
Springfield, Vermont, U.S.A.

Please send me your latest 24 page catalog covering the complete line of Lovejoy Milling Cutters.

NAME _____

CO. _____

ST. _____

CITY _____ STATE _____

M

KIPP *air* GRINDER..

Madison-Kipp tool-makers originated the first really high speed grinder. They know a great deal about the practical side of grinder design and grinder usage. They think the new Model H is the best all around off-hand tool they have ever tried and we are sure you will agree with them.

50,000 R.P.M. was set as the standard speed for the Model H. We have sold grinders that turned up 100,000 R.P.M. We have produced grinders that nearly doubled even that terrific speed. Our long experience has clearly influenced us to promote 50,000 R.P.M. for best universal service. We will provide higher speeds only as specials.

The new fast Model H has many new desirable features. In its price you get the advantage of an unusual situation in the sale of all Kipp Air Tools and Accessories, namely that a very large percentage of all orders is sent direct to the factory at Madison.

Use This Coupon

Use this coupon as a requisition to your P. A. or as an order blank.

Please attach preference rating certificate number with order

Ship by P.P. to.....

Address.....

Authorized by ..... Title.....

One Model H Kipp Grinder. Price $29.75 f.o.b. Madison

Kipp Air Tools manufactured by Madison-Kipp Corporation, 209 Waubesa St., Madison, Wis.

MADISON-KIPP CORPORATION, 209 Waubesa St., Madison, Wis., U. S. A.

Heald Saves

FLOOR SPACE
★
MAN POWER
★
COST OF EQUIPMENT

The following is torn from a National Machine Tool Magazine

The machining of the twenty trunnions that project from the face of reduction gear carrier rings is now performed on Heald "Bore-Matics" equipped with two cutting heads in the manner shown above. The parts are loaded on an indexing head, which advances by a rapid hydraulic movement to the feed position. Two diametrically opposite trunnions are then fed into tungsten-carbide tipped, adjustable-blade hollow mills which turn the outside diameter and face the shoulder. When finished, the work-head withdraws and indexes automatically to bring the next two trunnions in line with the cutters. When the twenty trunnions have thus been turned and faced, the machine automatically stops while the part is unloaded. Two of these machines take the place of eleven single-spindle drill presses. The saving in man power amounts to twenty-seven men a day, while the saving in machine costs amounts to almost eight times the cost of the two machines.

THE ABOVE IS ONLY ONE OF THOUSANDS OF JOBS WHERE HEALD ENGINEERS HAVE MET THE PRESENT DAY DEMANDS FOR METHODS AND MEANS OF SPEEDING PRODUCTION

THE HEALD MACHINE CO. WORCESTER, MASS. U. S. A

BRAEBURN ALLOY STEEL CORPORATION
(Pittsburgh District)
BRAEBURN, PA.

Braemow

Tungsten Molybdenum High Speed Steel

Chemical Analysis

Carbon	Chromium	Tungsten	Molybdenum	Vanadium
.80	4.00	5.75	5.25	1.50

Heating Instructions

FORGING 1800°F./1900°F.

Temperature range while forging is important. Molybdenum High Speed Steels do not have as high or wide forging temperature ranges as Tungsten (18-4-1) High Speed Steels.

ANNEALING 1600°F.

HARDENING*

Preheat	1400°F.
High Heat	2200°F./2240°F.
Draw	1020°F./1150°F.

*Braemow, unless heated in a salt bath, will have a very slightly decarburized surface. Fine pitch hobs, thread mills, and form tools which are not to be ground after hardening should be protected during the preheat and high heat with a commercial protective coating or dipped in a saturated solution of boric acid heated to about 150°F.

Hardness Data

Draw °F.	2150°F. Oil	2200°F. Oil	2240°F. Oil	2250°F. Oil
As Quenched	C-64	C-65	C-65	C-65
1050°F.	C-63	C-65	C-65	C-65
1100°F.	C-61	C-63	C-63	C-64
1125°F.	C-60	C-62	C-62	C-62
1150°F.	C-59	C-61	C-61	C-61

Applications

Any purpose for which Tungsten (18-4-1) High Speed Steel is or has been used.

Write for Literature

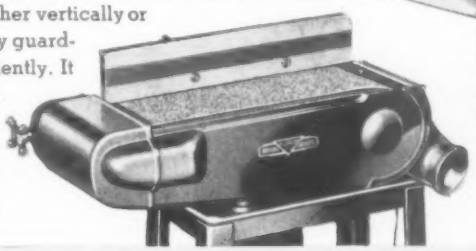
BRAEBURN ALLOY STEEL CORPORATION

BRAEBURN **PENNA.**

RIGHT NOW ... for Armament work you can use these Abrasive Finishing Machines

☆ DELTA Abrasive Belt Finishing Machine

When you are confronted with an urgent need for increased production in connection with the U. S. armament program—check into the possibilities of these Delta machines. Here is a 6" Abrasive Belt Finishing Machine that is heavy and husky enough to do any of the dozens of sanding, polishing and finishing operations to be found around the average shop, yet which is portable enough to be used just where it is needed. It has found wide acceptance for finning, finishing and surfacing metal and plastic parts. Every feature has been designed to eliminate disadvantages usually found in small belt polishing machines. The frame is heavy and substantial; the adjustments convenient and positive in action; attachments are quickly attached or removed; the machine may be used either vertically or horizontally, as required. It is completely guarded, and dust removal may be made efficiently. It is completely ball-bearing equipped with double-seal bearings, lubricated at the factory for life. There is no rubber covering required on the drums which eliminates one source of replacement expense.



No. 1402-C—Abrasive Belt Finishing Machine

☆ DELTA Abrasive Disk Finishing Machine

Designed to meet every requirement for accurate finishing, this Delta Abrasive Disk Finishing Machine is a high-grade tool for high grade work. From its completely machined, true-running 12" disk to its large surface table and the husky spindle of the belt-drive machine, carried on self-sealed ball bearings, it is designed for long life, low power consumption and accurate, dependable results.

Made on two models; one a direct-drive unit employing either a ½ H.P. or a ¾ H.P. ball-bearing motor. The disk in this unit fits directly onto the end of the motor shaft, making the machine completely self-contained. The other model is a belt-drive unit, which makes it possible to use any motor available, to use motors built for odd frequencies or voltages and to vary the speed to suit individual operations.

Dust collector available, making machine adaptable for use in locations where dust is objectionable.

No. 1426—Abrasive Disk Finishing Machine

Send for CATALOG

giving full details and prices on Delta Abrasive Finishing Machines—and also showing full line of Delta drill presses, grinders, band saws, and other Delta low-cost machine tools.

DELTA PRODUCTION TOOLS

DELTA MILWAUKEE

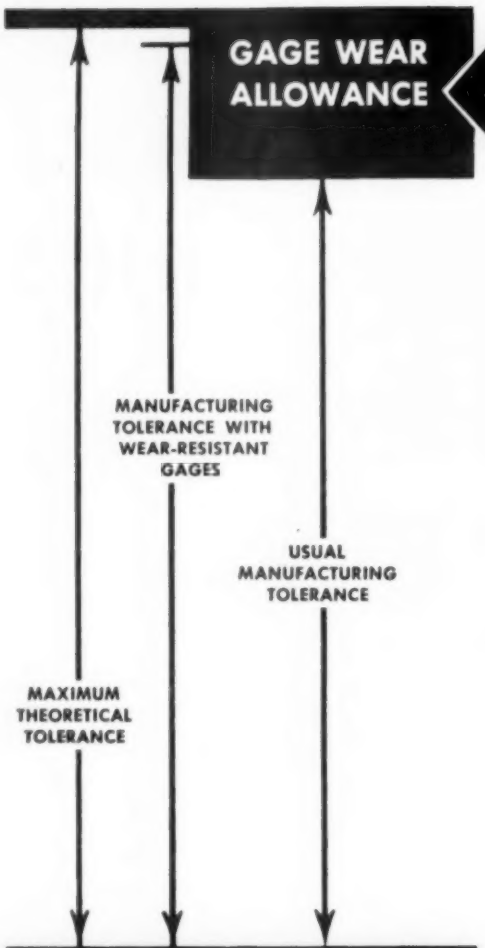
THE DELTA MFG. CO.
609-E E. Vienna Ave., Milwaukee, Wis.

Please send me Catalog giving full details and prices on Delta Abrasive Finishing Machines, and your full line of low cost machine tools

Name .....

Address .....

City ..... State .....



Gage wear allowance can be reduced in proportion to the materials used. With chrome plated gages, as much as five times the wear-resistance of steel can be expected. Carboloy gages are fifty times as wear-resistant as those made of steel.

Increased manufacturing tolerances can assure immeasurable gains in your production. Gages produced by Lincoln Park can give them to you.

HERE'S WHERE YOU GAIN *Manufacturing Tolerances* WHEN YOU USE LINCOLN PARK'S WEAR-RESISTANT GAGES

● The diagramatic sketch at the left shows, in exaggerated scale, the relation between maximum theoretical tolerances and net manufacturing tolerances in average gaging practice.

With any gages, wear allowance must always be taken into consideration. However, when wear-resistant gages are used, it is obvious that the allowance for wear can be reduced considerably . . . automatically increasing the manufacturing tolerance. This slight extra percentage of tolerance becomes highly important when the dimensions of parts being inspected are very close to the required limits. It eliminates rejection of parts which should have been accepted . . . and, in many cases, effects great savings both in expensive parts and man-hours.

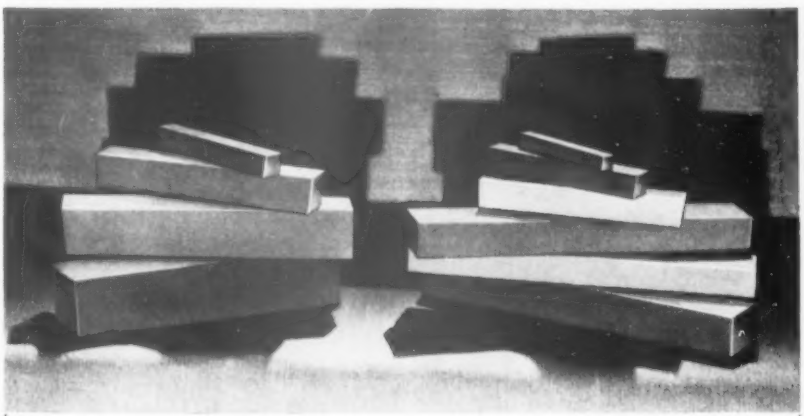
Lincoln Park manufactures both hard chrome plated and Carboloy gages. Worn steel gages are also salvaged by hard chrome plating in the Lincoln Park plant. The extra wear-resistance provided by these gages always makes possible the desired reduction in "wear allowance". In addition, their much longer life eliminates the need for frequent replacement. Now—or at any other time—wear-resistant gages can be depended upon to give you the most for your "gage dollars".

LINCOLN PARK TOOL and GAGE CO.
LINCOLN PARK, MICHIGAN

For Quick Delivery and Smaller Inventory– Order Standard HAYNES STELLITE TOOL BITS

STANDARD Haynes Stellite tool bits are available for immediate delivery in a complete assortment of sizes—in both square and flat shapes. These solid bits can be readily converted to the various special cutting profiles required for different machining operations, so that any one size will serve for a wide variety of jobs. It is thus possible to hold your tool inventory at a minimum.

Also available for immediate delivery are Haynes Stellite standard welded tip tools which consist of a cutting tip of cast Haynes Stellite alloy welded to a tough steel shank. They can be used where solid bits are impracticable. Haynes Stellite standard milling cutter blades are also carried in stock for immediate delivery. Write or phone today for full information.



STOCKED FOR IMMEDIATE DELIVERY

Standard Star J-Metal and 2400-Metal tool bits are furnished in square and rectangular shapes ranging from 2 to 6 in. in length. These tools are finish ground with tolerances of plus 0.000 in., minus 0.005 in. on cross-sectional dimensions, and plus or minus 1/8 in. on length. Sizes are listed below.

Standard Square Sizes, inches	
3/16 sq. x 3	1/2 sq. x 4 1/2
1/4 sq. x 2 1/8	1/2 sq. x 5
1/4 sq. x 3	1/2 sq. x 6
5/16 sq. x 2 1/4	5/8 sq. x 3
5/16 sq. x 2 1/2	5/8 sq. x 3 1/2
5/16 sq. x 3	5/8 sq. x 4
3/8 sq. x 2	5/8 sq. x 4 1/2
3/8 sq. x 2 1/2	5/8 sq. x 5
3/8 sq. x 2 3/4	5/8 sq. x 6
3/8 sq. x 3	3/4 sq. x 3
3/8 sq. x 3 1/2	3/4 sq. x 3 1/2
3/8 sq. x 4	3/4 sq. x 4
3/8 sq. x 6	3/4 sq. x 4 1/2
7/16 sq. x 3	3/4 sq. x 5
7/16 sq. x 3 1/2	3/4 sq. x 5 1/2
1/2 sq. x 2 1/2	3/4 sq. x 6
1/2 sq. x 3	7/8 sq. x 5
1/2 sq. x 3 1/2	7/8 sq. x 6
1/2 sq. x 4	1 sq. x 5

Standard Rectangular Sizes, inches	
3/16 x 3/4 x 4	3/8 x 1 x 4
1/4 x 5/16 x 1 1/2	3/8 x 1 x 4 1/2
1/4 x 3/8 x 2	1/2 x 5/8 x 3
1/4 x 3/8 x 6	1/2 x 5/8 x 4
1/4 x 1/2 x 4	1/2 x 5/8 x 5
1/4 x 1/2 x 6	1/2 x 3/4 x 3
1/4 x 3/4 x 6	1/2 x 3/4 x 4
5/16 x 1/2 x 3	1/2 x 3/4 x 5
5/16 x 1/2 x 6	1/2 x 3/4 x 6
5/16 x 5/8 x 4	1/2 x 1 x 3
5/16 x 3/4 x 6	1/2 x 1 x 4
5/16 x 1 x 4	1/2 x 1 x 5
5/16 x 1 x 6	1/2 x 1 x 6
3/8 x 1/2 x 2	5/8 x 3/4 x 3
3/8 x 1/2 x 3	5/8 x 3/4 x 4 1/2
3/8 x 1/2 x 4	5/8 x 3/4 x 5
3/8 x 1/2 x 6	5/8 x 3/4 x 6
3/8 x 5/8 x 3	5/8 x 1 x 4 1/2
3/8 x 5/8 x 4	5/8 x 1 x 6
3/8 x 3/4 x 3	5/8 x 1 1/4 x 4
3/8 x 3/4 x 6	5/8 x 1 1/4 x 6
3/8 x 3/4 x 4	3/4 x 1 x 5
3/8 x 1 x 3	3/4 x 1 x 6

The cutting ends of square bits are ground with a 7-deg. front clearance, and the gate ends of square and rectangular bits are notched so they will not be used for the cutting edge.

HAYNES STELLITE TRADE MARK

Red-hard, wear-resisting alloys of cobalt, chromium and tungsten

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

New York, N. Y. Kokomo, Indiana

Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

• HIGH-PRODUCTION METAL-CUTTING TOOLS •

"Haynes Stellite" is a registered trade-mark of Haynes Stellite Company

THAT WE MAY SAVE *Every* AVAILABLE *Man Hour* FOR OUR DEFENSE INDUSTRY

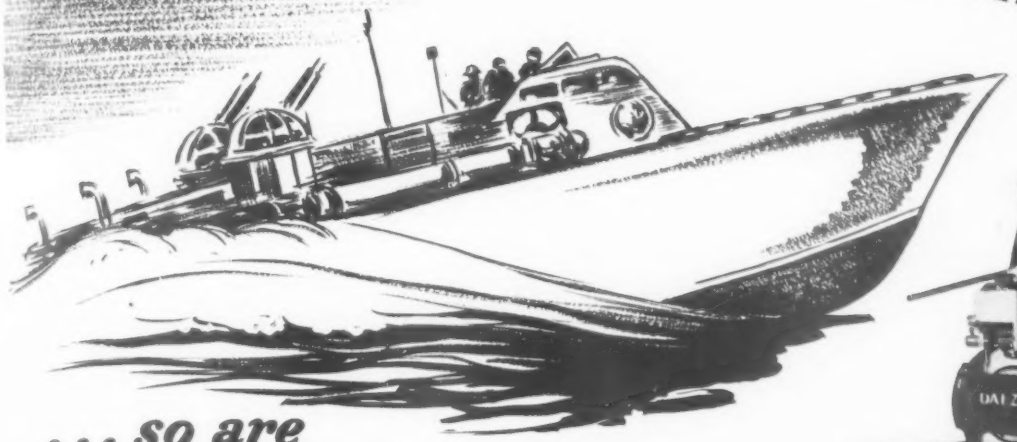
★ By the thorough, experienced reconditioning of tools our three companies were privileged last year to save more than 2,000,000 man hours for American industry. The saving was accomplished by what we believe are the most complete facilities of their kind in the world. Through using this service manufacturers have found it possible to reduce their cutting costs as much as 50%. They tell us, too, that our hard chrome process produces a tool definitely superior to the original, with a longer life and lower maintenance expense.

A COMPLETE RECONDITIONING SERVICE FOR TOOLS

EASTERN CUTTER SALVAGE CORPORATION, 30-32 LITTLETON AVE., NEWARK, N. J.
Western Plant · MASTER TOOL CO., INC., 5605 HERMAN AVE., N. W., CLEVELAND, OHIO
Chrome Plant · MASTER CHROME SERVICE, INC., 5709 HERMAN AVE., N. W., CLEVELAND, OHIO

SMALL IN SIZE—

BIG IN PERFORMANCE!



... so are

DALZEN

· VERTICAL ·

THREAD GRINDERS

43" WIDE
39" DEEP
72" HIGH

48" WIDE
38" DEEP
75" HIGH

The "mosquito boat" and modern machine tools are alike in one respect —***they're fighting machines!*** Mosquito boats and Dalzens are ***both*** triumphs of design and construction for the work in hand... packing tremendous performance in small space. When it comes to thread grinding Dalzens DO MUCH MORE—TAKE LESS FLOOR.

Do much more • *take less floor*

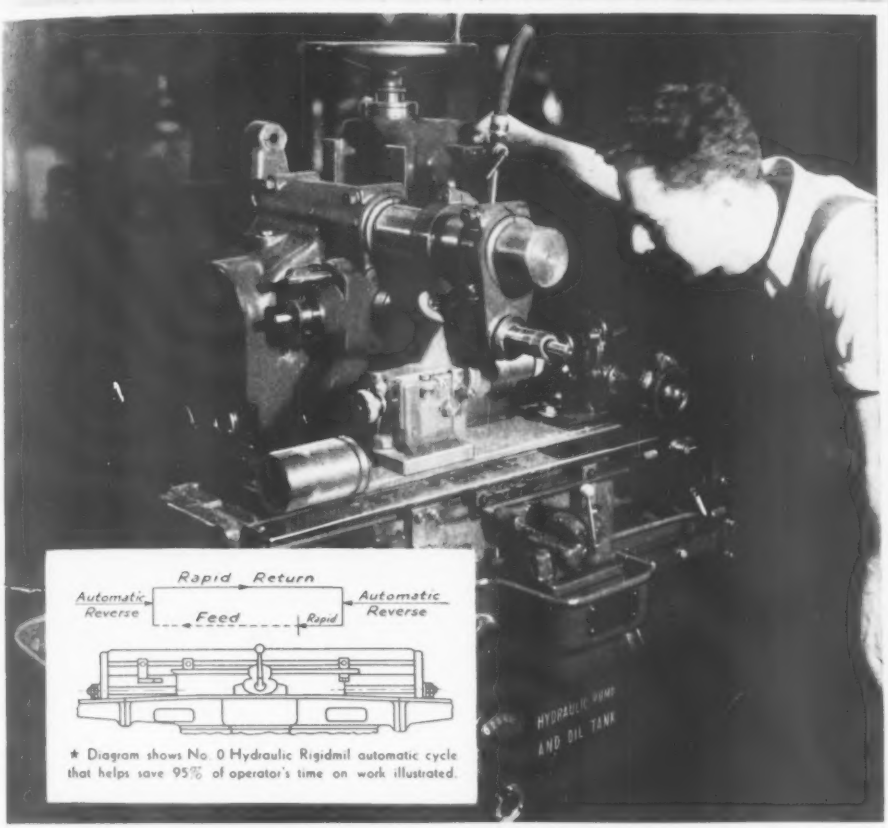
Today two things are of paramount importance in American Industrial Plants: (1) more work, higher speeds and (2) most effective utilization of given floor space. Dalzens meet both requirements and you can use the saved floor space for added equipment or more efficient tool arrangement. Above you see Dalzen No. 2—grinds threads to 4" long anywhere on an 8" shaft, diameters up to 3". At left, Dalzen No. 1—grinds threads to 10" long anywhere on 18" shaft up to 6" diameters. Interested in more output in less space?

● ***Write for Bulletins***

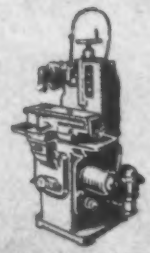
Note: We also make the Dalzen Combination Center Lapping Machine and Drill Press—two machines in one for half the floor space.

DALZEN TOOL & MFG. CO.
12255 E. 8 Mile Road — Detroit, Mich.

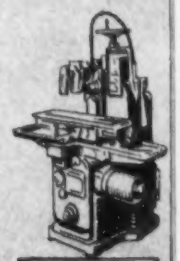
Engineered Production



★ Diagram shows No. 0 Hydraulic Rigidmil automatic cycle that helps save 95% of operator's time on work illustrated.



No 00 Rigidmil



No. 0 Rigidmil

No. 1 Rigidmil

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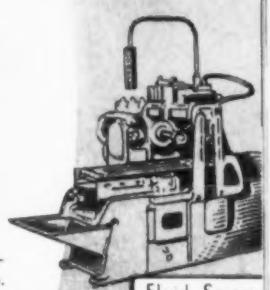
Condensed for fast reading, new Bulletin on No. 0 Rigidmil describes 26 features, 9 cycles, typical cost-cutting operations, has specifications and other data. Write, today, for Bulletin TO-1.



Fluid-Screw Rigidmil

Number 0 RIGIDMIL Saves 95% of Operator's Time

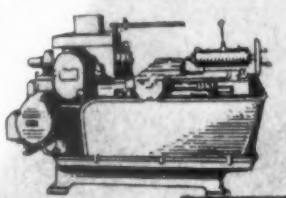
Multiple advantages of Sundstrand No. 0 Hydraulic Rigidmil are demonstrated by job shown above . . . slotting steel cylinders for knitting machines. Work-pieces range in length from 3" to 8"; slots from 0.010" to 0.090" wide, 84 to 340 per cylinder.

Automatic Cycle Saves . . . Dog-controlled table-cycle used for this work is continuous after starting; saves up to 95% of operator's time compared with old method. Job photographed formerly occupied operator 5 hours continuously. It now takes him about 15 minutes, then Rigidmil runs automatically for remaining 285 minutes.

Climb Cutting Saves . . . On job illustrated, climb cutting gives finer finish and cleaner cut compared with former method, saves a burring operation, reduces cutter breakage.

Hydraulic Feed Saves . . . Sundstrand hydraulic feed makes climb cutting possible on this job, improves finish, increases production, greatly increases former cutter-life. Rapid traverse of 325" a minute saves much time.

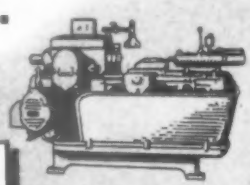
Use This Service . . . Sundstrand Engineered Production is at *your* disposal for applying Rigidmils most effectively on a wide variety of milling jobs. Write for complete information. Send data for specific proposals and estimates.



Model 12 Automatic Stub Lathe

Sundstrand Machine Tool Co.
2532 Eleventh Street, Rockford, Illinois, U. S. A.

Model 8 Automatic Stub Lathe



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In their respective fields, Sundstrand machine tools are unexcelled for high production, accuracy, and lasting value. Write for complete details.

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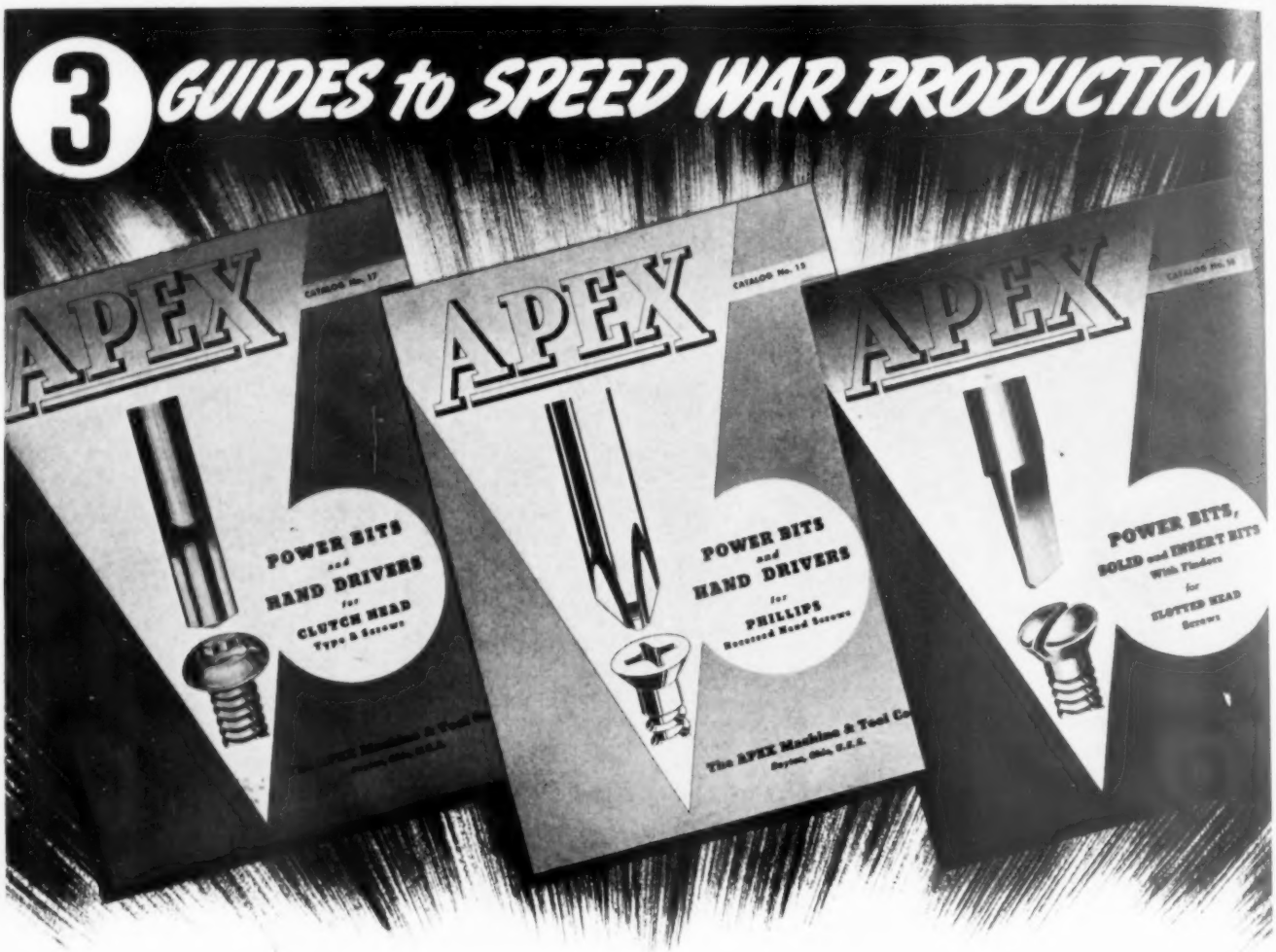

Wherever screws are used—Phillips Recessed Head, Clutch Head, or Slotted Head—APEX Power Bits and Hand Drivers are a direct contribution to speeding up War Production.

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You should have these three Guides to Power Bits and Drivers for ready reference. Each Bit is illustrated, with part number, dimensions and the power tool it fits. They will simplify your purchasing. *Write today.*

The APEX Machine & Tool Co.
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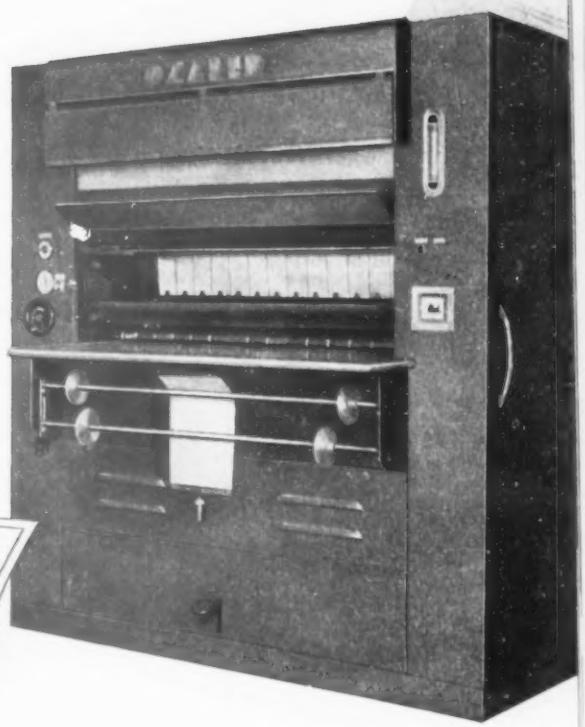
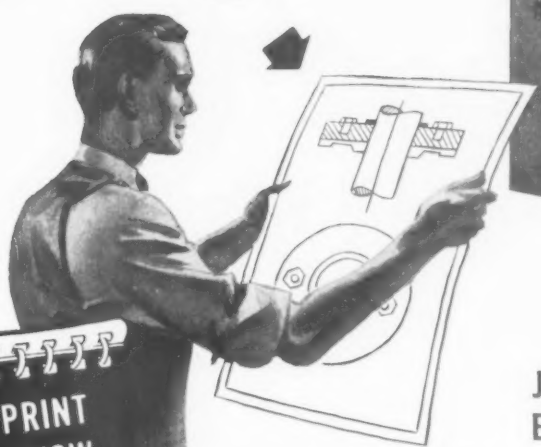
IN 2 FAST STEPS





BASIC FACTS ABOUT PRINT MAKING YOU SHOULD KNOW

OZALID TRANSPARENT FOILS ARE USED TO RECLAIM OLD, WORN, OR SOILED ORIGINALS . . . thereby enabling you to make prints from valuable originals which otherwise are no longer serviceable.

The lines on marred original tracings are intensified in duplicate originals made with Ozalid acetate foil. Any spots, blotches or crease marks reproduced on a duplicate original can either be erased, or cleaned with Ozalid Corrector Fluid.

In this way you secure a fast-printing intermediate original which will produce subsequent prints having strong line detail and a clear background.

This is the fifth of a series of facts on modern printmaking. Watch for Fact No. 6.

JUST TWO OPERATIONS . . . EXPOSURE and DRY DEVELOPMENT—

and prints are made of your engineering drawings, charts, graphs . . . made quickly, so that print production won't be held up and planes, tanks, and ships will roll off the assembly lines without delay!

The Ozalid Process turns out positive-type whiteprints of your tracings in ***seconds***—a compact machine performing the only two steps necessary: printing and dry developing! The tracing is placed on a piece of Ozalid sensitized material and fed into the machine. The finished print is dry—ready for instant use!

Ozalid standard materials offer you a choice of either blue, black or maroon line prints on a white background. Then, there are transparent papers, cloth and foils for producing duplicate originals, and a varied line of special materials.

Today—when speed in every department is vital, an Ozalid machine in your printroom is the answer to speedy print production.

Write at once for literature describing the many advantages and the versatility of the Ozalid Process.

SPECIFY *Ozalid* WHITEPRINTS

OZALID PRODUCTS DIVISION
GENERAL ANILINE & FILM CORPORATION
JOHNSON CITY, N.Y.

CLARK CONTROLLER COMPANY

BREAKS "Bottle-necks"

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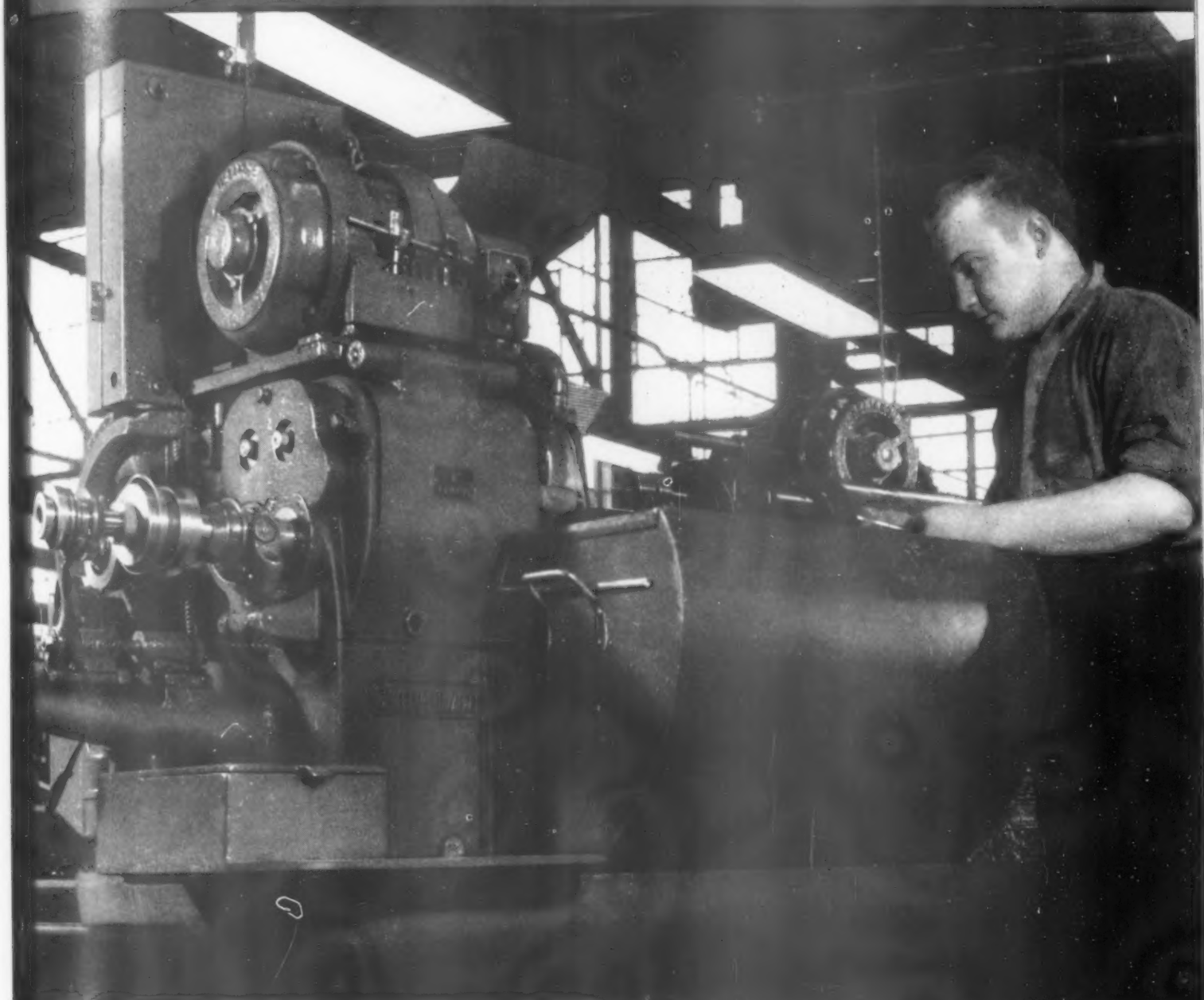

• Operators like Clevelands for the reason that they can average more pieces per hour—and there is little down-time for machine casualties because Clevelands are built sturdily and dependably to stand up under extreme service demands. • With literally a thousand-and-one electrical control devices to manufacture, Clark Controller Company relies on Cleveland Model A *Single Spindle* Automatics for *small lots and short runs* of a variety of parts. • Here a battery of 1 1/16-inch capacity Model A machines were crowded a little closer together to add a new one recently, and production goes on at top speed with skillful operators just old enough to vote! Ask for information about application of Clevelands to your *short run, small lot* production.

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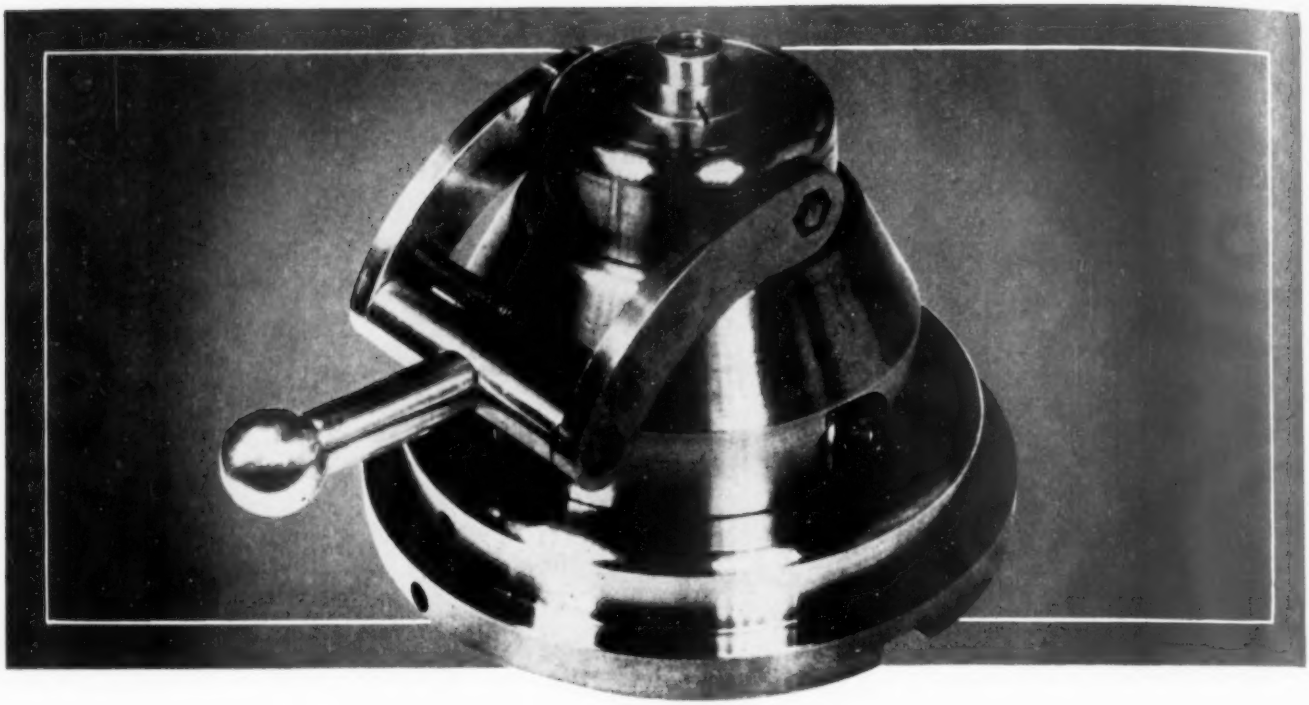

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COLLET INDEXING & HOLDING FIXTURES

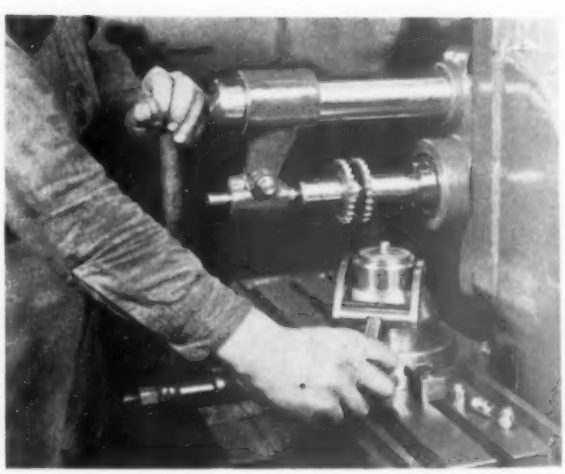
For milling squares, hexes, slots, etc., on screw machine work

Speed—just one handle to open, close and index collet.

Simplicity—easy to set up. Indexes from 2 to 25 may be obtained on separate index plates mounted with Allen Screws.

Durable and Accurate—made of hardened and ground steel throughout and guaranteed to withstand the abuse of high production.

Two sizes—1" and 2" using Standard W & S Collets or may be furnished to fit any collet. Furnished either with or without indexing. Maximum collet capacity—2 11/16" through the fixture. No chip trouble.



TEN DAY FREE TRIAL

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1" INDEXING $150.00	**2" INDEXING $250.00**
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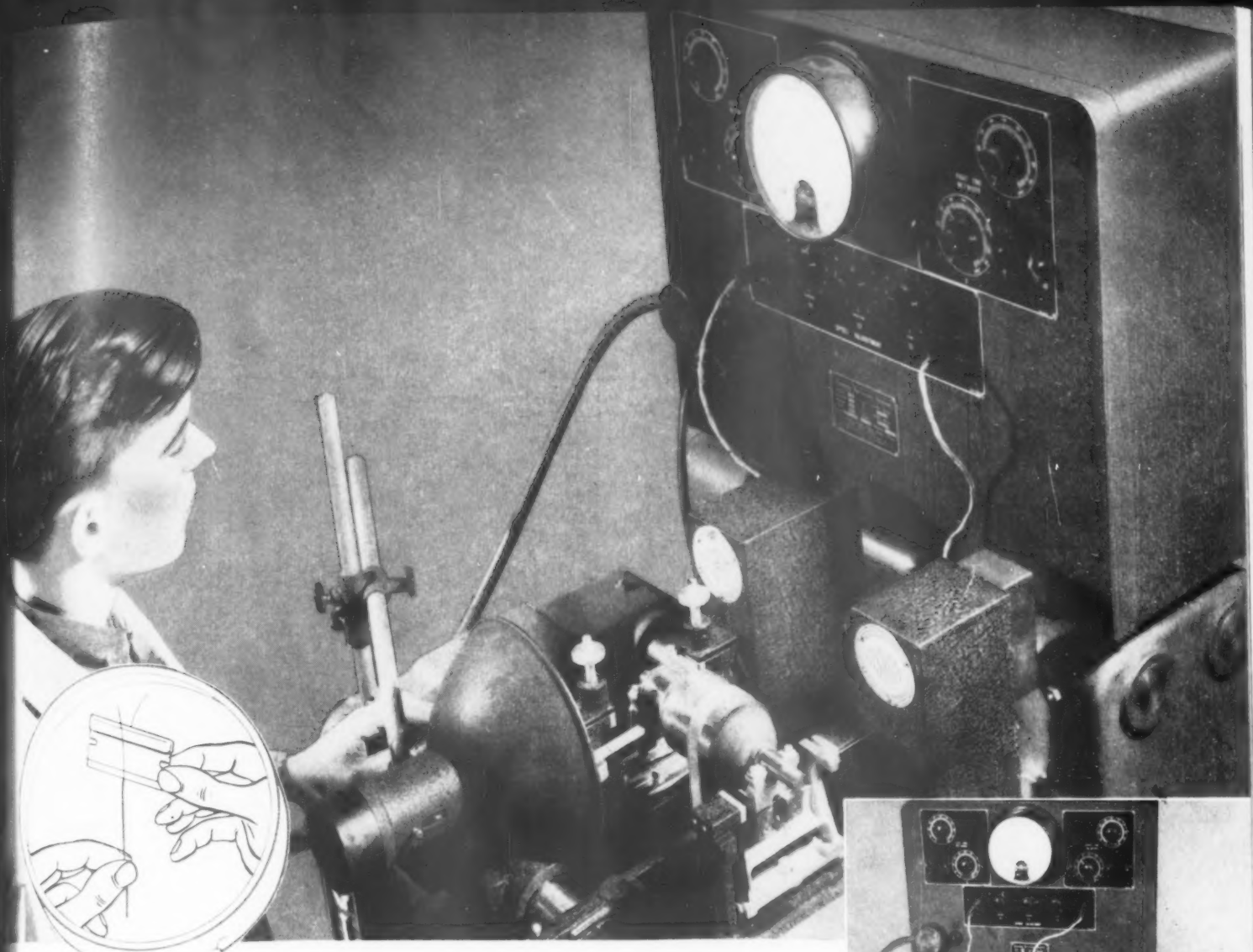
CLEVELAND **23885 LAKELAND BOULEVARD** **OHIO**



SPLITTING HAIRS IS CRUDE WORK

... BESIDE THIS!

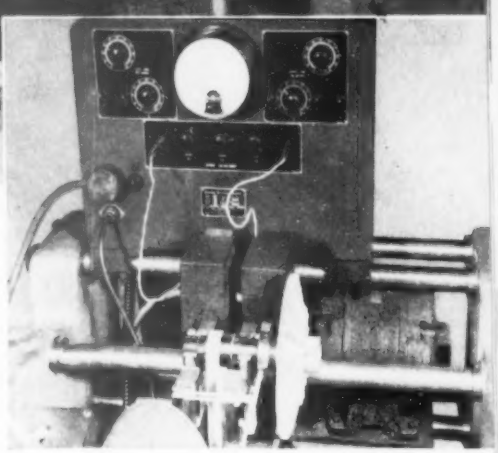
● Imagine a machine so sensitive that it can detect a movement of less than 25-millionths of an inch . . . approximately 1/120th the thickness of a human hair!

Yet this machine does even more. Electrically amplified, unbalance vibrations in high-speed rotating parts are not only detected, but also *located* and *measured* so that proper correction can be made. Although such extreme accuracy is not necessary in most commercial work, it indicates the amazing degree of precision possible with this modern balancing equipment.

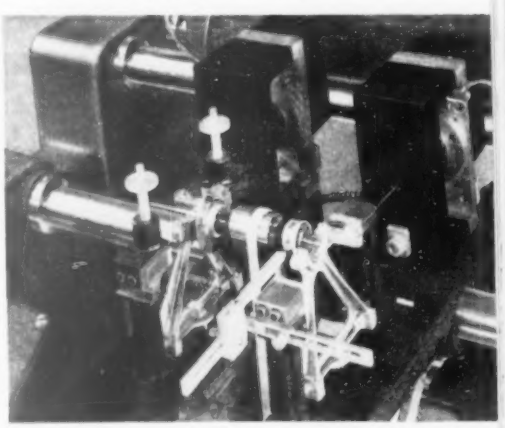
DYNETRIC BALANCING MACHINES

With the increasing trend toward higher operating speeds in modern machinery, proper static and dynamic balancing becomes more and more important. It enables you to "pre-test" the efficiency of high speed rotating parts to insure longer life and smoother performance.

With the new Gisholt Dynetrics, balancing reaches new limits of accuracy never before possible. Write for literature.



Extreme accuracy is imperative in balancing these super-charger impellers which operate at speeds up to 30,000 R.P.M. It is successfully done on the Gisholt Type-S Balancing Machine.



Balancing a typical high-speed armature. Numerals which revolve with work piece are picked out by Stroboglow lamp to locate point of unbalance.

Look ahead... Keep ahead... with Gisholt improvements

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HANNIFIN *Hydraulic* PRESSES ON THE JOB

● *20-ton Hannifin hydraulic press used for straightening hardened press brake dies.*

FAST AND ACCURATE

The production tempo of today can be summed up in two words—"more" and "better." Hannifin hydraulic equipment contributes its part. Hannifin Presses being used by producers of machine tools, aircraft, and armament, demonstrate every day the extra value of Hannifin design, including the exclusive sensitive pressure control. On straightening, forming, press-fit assembly, testing, and other

press operations, fast, accurate production is the natural result of this simple control of ram pressures.

Hannifin sensitive pressure control provides an infinitely variable control of ram pressures by either hand lever or foot pedal. Any ram pressure up to full capacity is available at a finger-tip touch, in proportion to the amount of control lever movement. Note that ram pressure, not ram travel, is under direct control of the operator.

Hannifin design provides all the advantages of standard construction, with welded steel frames, built-in hydraulic power, compact and simple installation, *plus* flexibility to meet individual needs. Table construction, gap, reach, and ram stroke may be readily modified, avoiding the delays incident to special design. Ram stroke is adjustable to avoid unnecessary up-travel of the ram in production operations.

If you have a problem of production operations involving the application of pressure, find out what Hannifin hydraulic press performance can accomplish for you. Write for press bulletins, or consult Hannifin engineers for individual recommendations.

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HANNIFIN
***Hydraulic* PRESSES**

THE TOOL ENGINEER

T.M. Reg. U.S. Pat. Office

Volume XI, Number 5

To Compete, Cooperate

WE will first state a case, then advance a proposition. Until total war cancelled out "business as usual", American industry operated, if it did not exactly thrive, on a competitive basis. True, big business may have subscribed to the unwritten law of the jungle at times, so that many smaller enterprises—too many, the reformers say—have been absorbed by the trusts and combines. Yet, even the trusts have their merits, as the unprejudiced will concede. For, where emulation inspired invention among the independents, it also, in altogether too many instances, spelled ruinous competition. Small concerns, vieing for existence, were unable to amass the reserves necessary for development and expansion or to bridge a depression. Hence, they either failed or sold out, narrowing the field to shrewder rivals who, profiting by vicarious experience, decided that cooperation was preferable to cut-throat competition. The survival of the fittest isn't so much a matter of jungle law as of planned design, now patly applicable to the winning of the war.

Merger did not stifle competition, merely made it more profitable, both to the producer and the consumer. With their vast capital resources, the big corporations have been able to encourage research and development on a scale far beyond the means of individuals and small concerns, and the findings and benefits of this research have been passed on to the ultimate consumer, enhancing national wealth and standards of living; now, they will doubtless insure our national integrity. Under either system, however—as independent competition or merger restriction—there has been material progress; competition spurred invention but the combine applied the check rein of control. Yet, in both fields, the open and the closed, competition has been leavened with cooperation. Standards have been established, reducing inventories and creating order out of confusion, while the technical press, the lecture platform and the engineering convention have each become forums for the exchange of ideas, for the broadening of human knowledge. It is evident, then, that competition by itself can be ruinous, but that competition tempered with cooperation spells success.

As a pat example, Tool Engineers are innately competitive, their very existence being predicated on invention and emulation—the will to excel. But, they are as natively cooperative, and certainly industry, and the nation as a whole, stands to benefit from the ideas advanced in their forums. That is cooperation of the highest order, worthy of emulation by all of industry. For, consider that we are engaged in the mass manufacture of products which, because of their very nature, must not only be intensively standardized but as nicely interchangeable.

American industry is now merged in the biggest combine of all time—the government of the United States of America. More, we are engaged in the biggest enterprise of all time, with the stakes far beyond the ken of the average mortal. We are engaged in competition with a combination of powerful forces committed to our destruction or, at least rendering us impotent as a factor in a new world order to be established should the Allied Nations fail to weather the tearing blasts of total war. We can survive, bending to the initial onslaught, provided that we learn, as a nation, to cooperate among ourselves. Competition that does not imply the fullest cooperation is out for the duration.

Give your Taps a "BREAK" or they will BREAK

KEEP them in good condition by sharpening them frequently. Use dulls them as it does all cutting tools and when dull they are likely to chip, break and produce rough or oversize threads.

Here are some suggestions which will help you get utmost service from your taps:

1. The minute a tap begins to get dull, sharpen it.

2. Take light grinding cuts to avoid "burning" the cutting edges.

3. Use a tap chamfer grinding machine, if possible, as it reproduces the original grind accurately. There are several good ones on the market. If you must grind by hand, note the following:

a. As a rule, grind the chamfered portion only. (Note the diagrams which show correct results of grinding and—exaggerated—two common errors.)
b. Have a new tap handy for comparison regarding number of threads chamfered.
c. Use a soft 80 grain wheel.

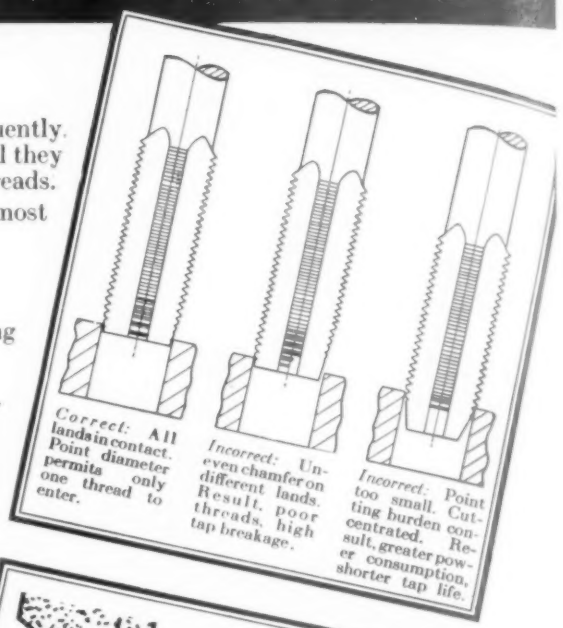
4. If tap needs grinding in flute, to touch up the edges, use a universal grinding machine and a hard 60 grain wheel. Use a saucer wheel for a radial or straight rake and a disc wheel formed to the hook for a hooked rake. (Note the sketches which show how to handle this job.)

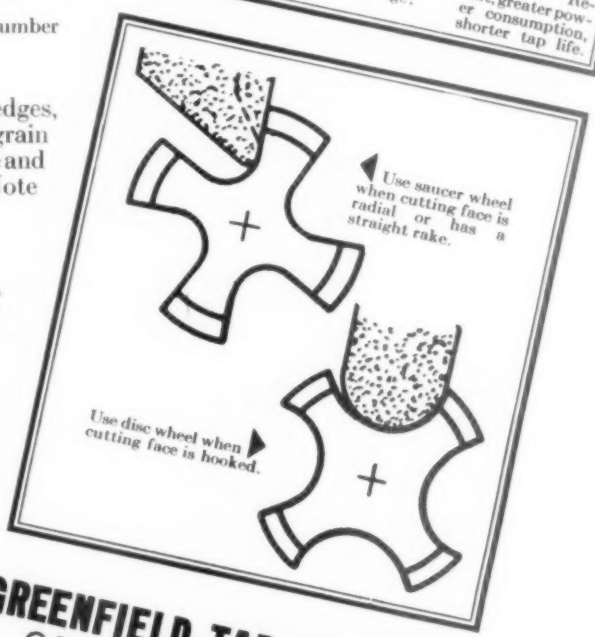
5. Completely grind away any broken teeth.

6. Polish the ground portion after sharpening if you are tapping soft or stringy materials that have a tendency to "load" the tap.

7. Taper Pipe Taps should always be machine ground and mechanically indexed to eliminate tapping out-of-round holes.

Remember that all taps become dull when in constant use. It takes more power to drive them and they often slow down the tapping machine resulting in lower production and excessive tap wear. *Keep your taps sharp.*





This is one of a series of advertisements published by the Greenfield Tap and Die Corporation to help users get greater production from their taps. The entire series is now available in booklet form. Send for a copy.

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Unionmelt Welding

dark horse of defense

A. E. RYLANDER

Industrial Engineer

Knudsen called for armor plate welding. They said "It can't be done." Here's a story of what's being done.

UNIONMELT is a new revolutionary welding process developed by The Linde Air Products Company, unit of Union Carbide and Carbon Corporation. According to its producers, Unionmelt welding "is an electric process using the heat generated by the passage of an electric current from an electrode to the work being welded. The end of the electrode is constantly covered by a highly resistant, conductive medium supplied as a special granulated material or welding composition known by its trademark 'Unionmelt.'

No Visible Arc

"This granulated material is laid down in the seam to be welded, and the entire welding action takes place beneath it, without an open, visible arc, and without sparks, spatter, smoke or flash. Within the layer of 'Unionmelt' an intense, concentrated heat is generated by the electric current, and the bare metal electrode and a portion of the edges being welded are melted and fused. When a weld is being made, a sub-surface layer of the granulated material melts and floats as a liquid blanket over the molten weld metal." The Unionmelt welding composition performs several important functions. It makes possible the use of higher current densities than for other welding methods, which in turn permits the rapid generation of the intense heat which melts the metal. Being an excellent heat insulator, it concentrates the heat in a relatively small welding zone and acts

When, a while back, production wizard Wm. Knudsen was working for a dollar a year or so as O.P.M. Co-Director, he rather startled the mossbacks in Ordnance by proposing that armor plate be welded. "Had never been done," he was told, in effect, "and it can't be done." That was all that a Tool Engineer needed to try the impossible, and the result was that another job that couldn't be done was proven feasible. Now, Lt. Gen. Wm. Knudsen stands vindicated; American defense industry is welding armor plate and doing a right smart job of it—at least, the welded specimens stand up remarkably well under Uncle Sam's somewhat extreme inspection tests. And, from all indications, our boys in blue and khaki are going to have bottoms under their feet and rolling stock under their seats that will just run rings around the Axis. And that's not all. With the intensive study now being made of welding, and its largely unexplored possibilities, we may not only expedite Victory but set a dizzy pace in post-war industry. But that's a future prospect; right now, let's look at welding as is.

While Wm. Knudsen proved a thesis and centered interest on welding of armor plate, the proposal also initiated the starting throb of one of the biggest headaches ever experienced by Ordnance, Tool and Welding Engineers. Armor plate was allergic to most of the known methods used for mild steel and the industrial alloys, but, after a while, the patient began to respond as one engineering clinic after another emerged from all night sessions with a solution for first one, then another phase of the problem. Now, finally, relief is in sight; quality has been established, and so has speed, although there is still some experiment ahead before the two can be reconciled. That is, it is definitely known that armor plate can be and is being successfully hand welded under certain not too difficult conditions, and the speed (as of hand welding) is also definitely known. It's just that it's a bit too slow for mass production, and there's where Unionmelt welding may come in. In this connection, this writing is not a plug for a patented welding process, rather, may be considered an analytical survey of a method which, in the writer's opinion, may turn out to be the dark horse of defense. Adequately proven in the welding of mild steel, it has possibilities in the welding of armor plate.

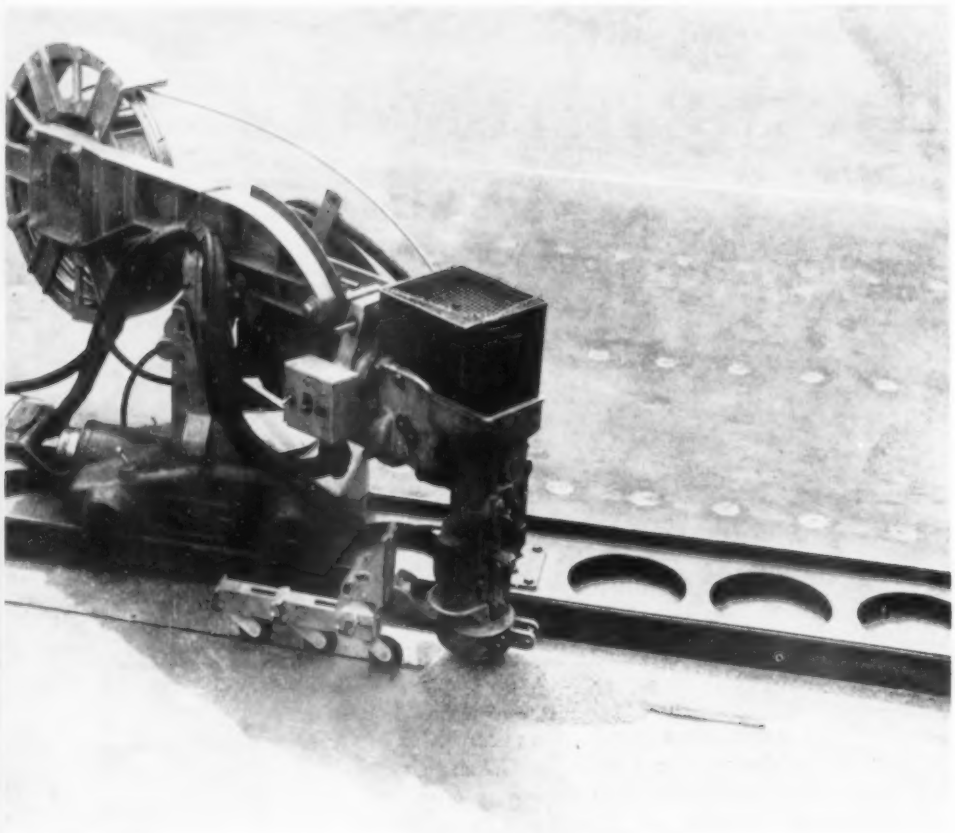


FIGURE 1 — SHOWS THE COMPLETE "UNIONMELT" WELDING UNIT IN THE INTERMEDIATE SIZE, MOUNTED ON A TRACK. KNURLED WHEELS ENGAGE THE TRACK, WEIGHT OF THE UNIT INSURING SUFFICIENT TRACTION FOR ANY RATE OF SPEED DESIRED. AS CAN BE SEEN, THE JOB IS CLEAN AND SELF-CONTAINED, APPLICABLE TO MOST WELDING OPERATIONS WITHOUT IMPROVISING.

as a cleaner for the weld metal, washing the metal which melts from the rod while, at the same time, it absorbs impurities from the fused base metal. Since the atmosphere and other gases are excluded by the protective layer of molten Unionmelt, the weld metal is left exceptionally clean and dense, with physical properties rather unusual for large weld-metal deposits. While the constituents of the Unionmelt granulated material do not enter into the weld, it is claimed that special alloying elements can be introduced into the weld metal by means of this material.

Entirely Automatic

The process is entirely automatic, but since the granulated material is not a conductor of electricity when cold, a "fuse"—such as a wad of steel wool—is used as a starter. This, covered with the material, becomes hot enough when the current is turned on to melt the adjacent layer of Unionmelt. Then the welding operation starts and continues without interruption to the end of the weld.

Faster Wire Feed

Once started, the welding composition is progressively fused as the weld proceeds. In common with most automatic welding, the rod is continuously fed into the welding zone by a welding head. The wire, however, is bare instead of being flux coated, the granulated material making this unnecessary. Naturally, the feed of wire is much faster than in ordinary machine welding, rate of feed depending on the cross section area of the joint and the speed at which it is welded.

In addition to the wire feed, automatically held to a predetermined rate, there is also a hopper which feeds the granulated material to the vee just ahead of the welding action. Only a part of the composition is fused during the weld, and the unfused material is picked up—usually by suction—and returned to the hopper for further use. The fused material, however, solidifies beneath the weld and, on cooling, contracts and detaches more or less after the manner of a scab on a healed wound, leaving the healed flesh smooth and clean.

Well, so much for preliminary description. Fig. 1 gives an excellent idea of the complete unit in the intermediate size, mounted on a track—usually, structural channels or I or H beams with the flanges of one side machined to a true track. Knurled wheels engage the track, weight of the unit insuring sufficient traction for any rate of speed desired. From a design viewpoint, the job is clean and self contained and is applicable to most welding operations without further improvising.

Fig. 2 is a "close-up", showing in detail the chutes from the hopper which deposits the granulated compound, the welding "nozzle" immediately in the back of it and, behind that, the suction nozzle which recovers the unfused material. The strip of fused granular material immediately underneath it is peeled off at the extreme right to show the finished weld. The cross section sketch, Fig. 3, amplifies the cut and shows the method in considerable detail.

Compared to Hand Welding

Let us, here, effect a comparison between this process and its extreme alternate, hand welding. Referring to Fig. 4 as an example, we have a butt joint of two ½" plates, each bevelled ⅜" x 45°, making a section area of .14". To hand weld would take three or four passes, depending on size of rod used, besides which it would be necessary to clean or chip each bead before the next was laid. (We're talking about armor plate now, not mild steel.) Taking the lower figure— i.e., three passes and a rate of 3" per minute—it would take 100 minutes or 1-2/3 hours to weld a seam 100" long, to which chipping time would have to be added—say about 2 hrs. for the job. But with Unionmelt, at the rate of 13" per minute, more or less, the total time would be only 7.7 minutes for the weld. And, from what the writer has seen, it's really a swell looking job.

Referring now to Fig. 5, we also have a butt joint, but in this case gapped ⅜" with the plates 1½" thick and bevelled about 37°. (The

angle of bevelling is still a mooted question as far as armor plate is concerned). The area for this angle would be about .56 per side, requiring about 12 passes per side, in ratio to Fig. 1, but presumably done in less—say 10 passes plus chipping. But that would imply 333 minutes per side for a 100″ joint or 11 hrs. for both sides. But with Unionmelt at, say 8″ per minutes for 1½″ plate, the time per side would be about 12½ minutes per side—or 25 minutes for both sides for welding time alone exclusive of handling and turn-over. Quite a difference!

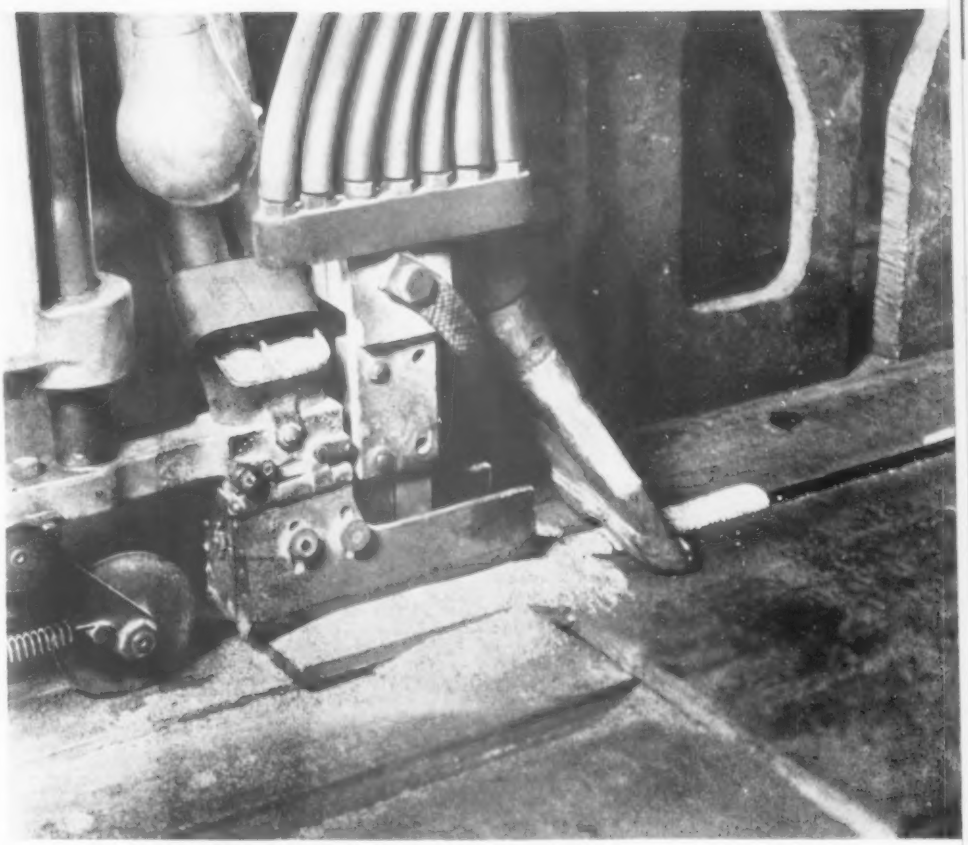
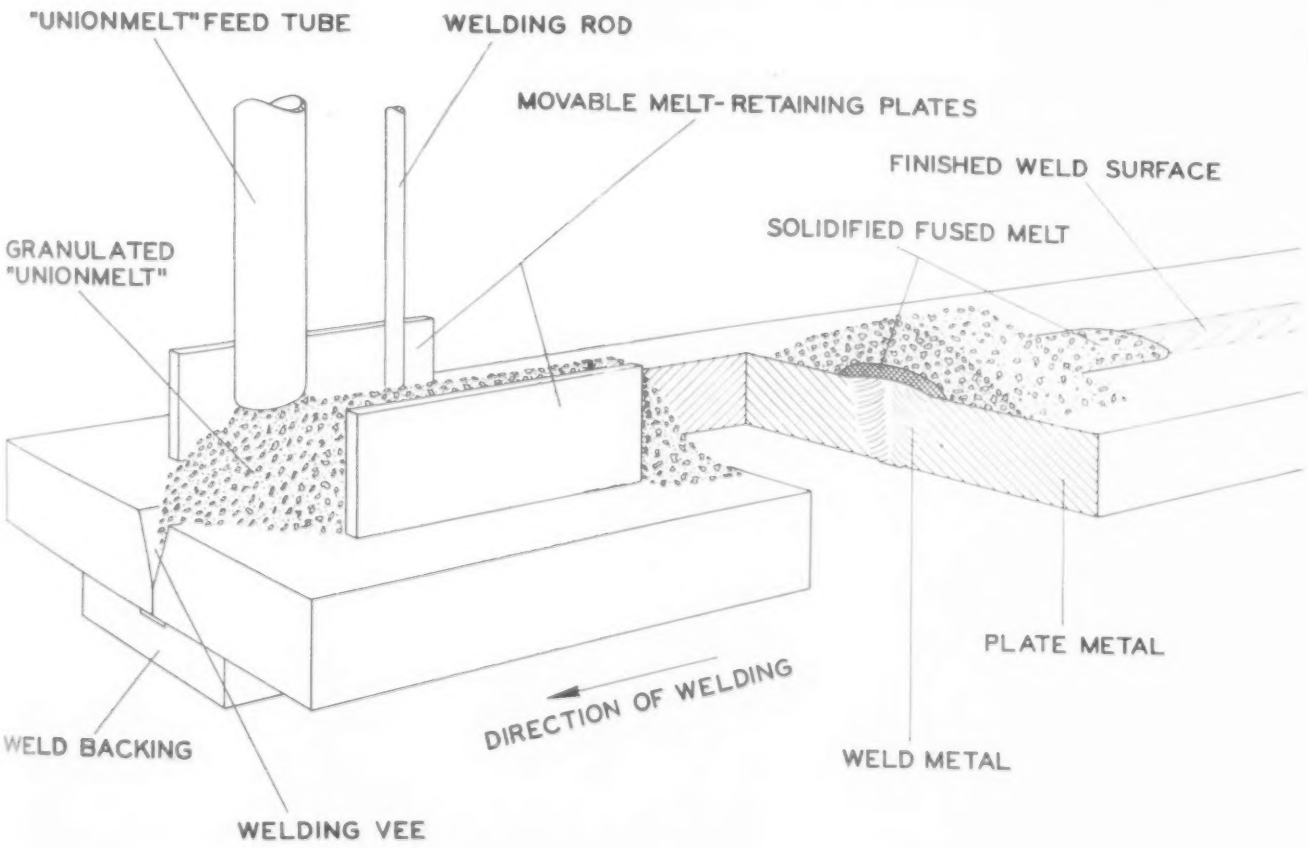


Figure 2—a "close-up" showing the chutes from the hopper which deposit the granulated compound, the welding "nozzle" and the suction nozzle which recovers the unfused material. The strip of fused granular material is peeled off at the extreme right to show the finished weld. Figure 3, below, shows the method in detail.



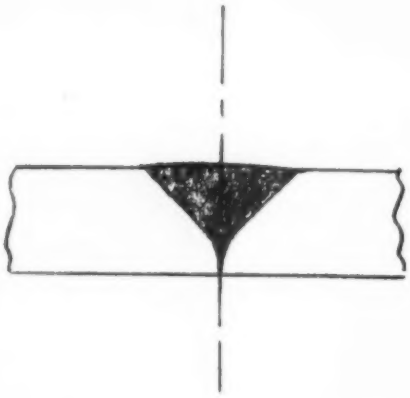


Figure 4, above, a butt joint of two ¼-inch plates, bevelled ⅜ inch x 45°, making a section area of .14 inches. Where hand welding might require more than 2 hours, per 100 inches, Unionmelt speeds the job to less than 8 minutes.

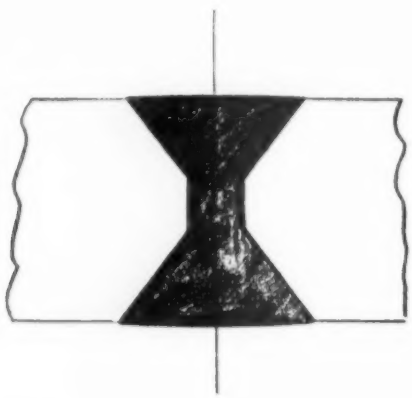
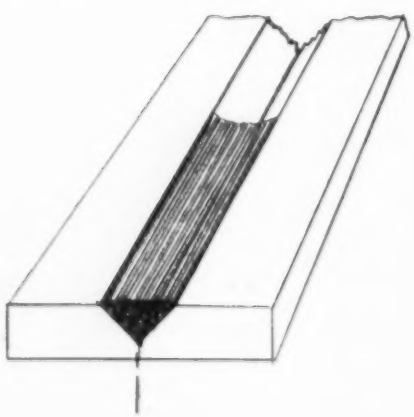


Figure 5, above, a butt joint, requiring 11 hours for both sides by hand weld, can be done—both sides—in 25 minutes with Unionmelt. Figure 6, below, illustrates need for closing ends of trough so Unionmelt will not run out.



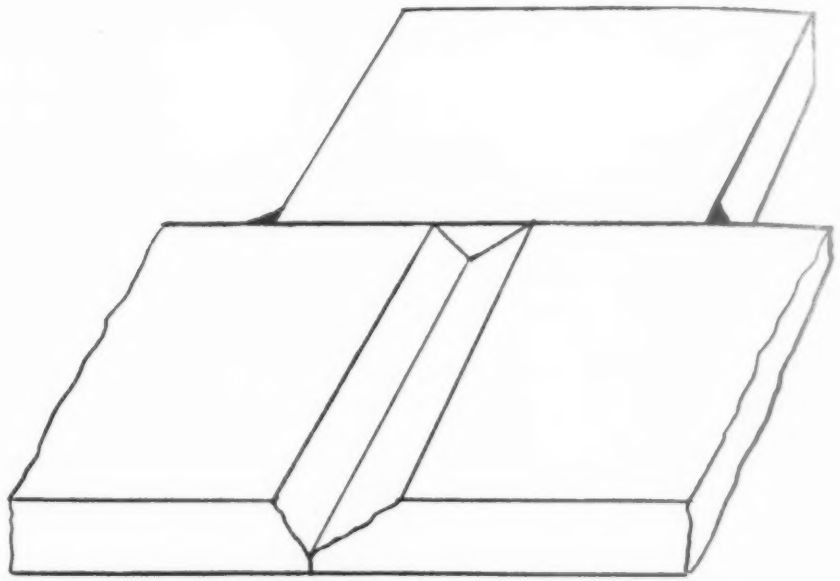


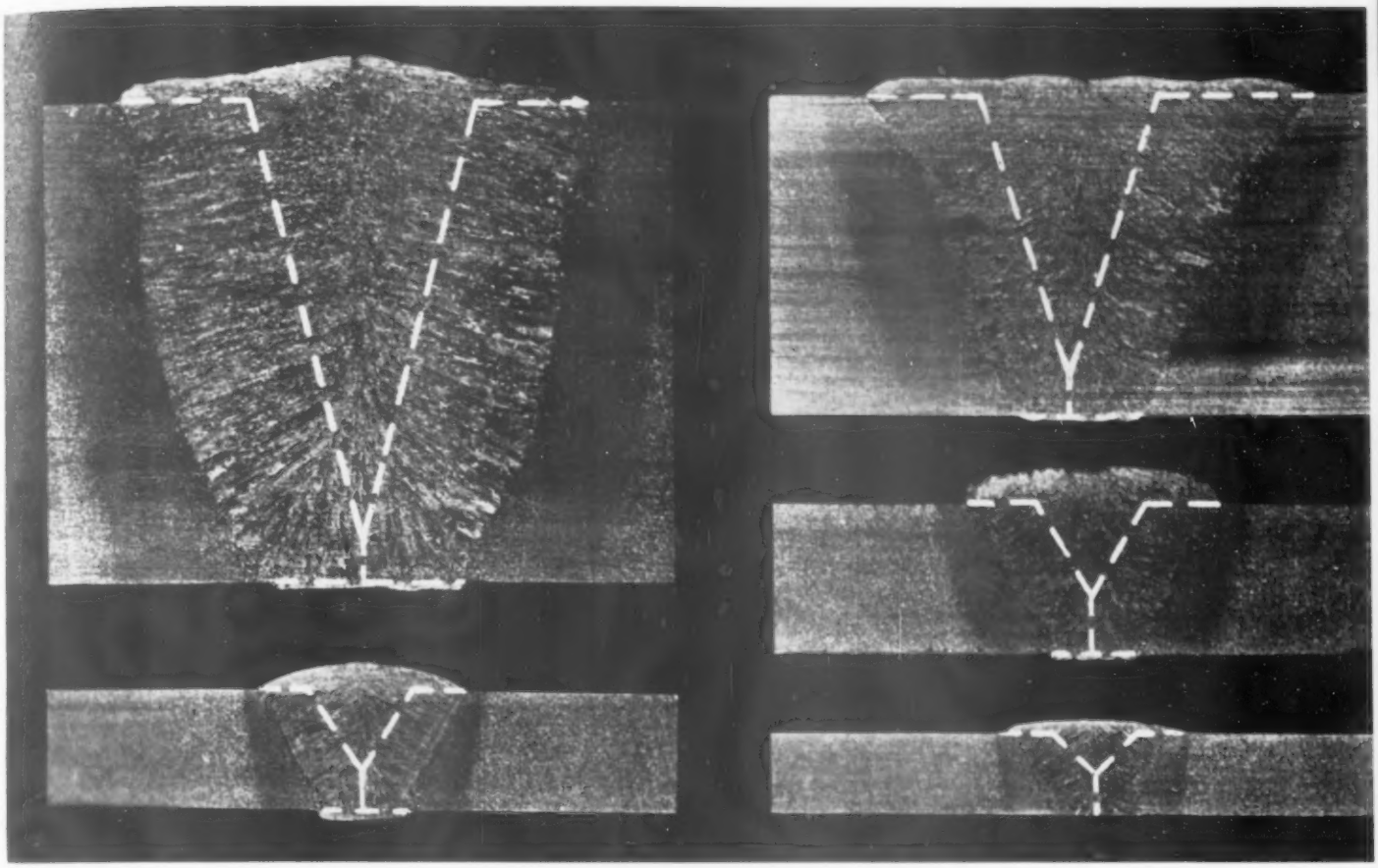
Figure 7—trough ends should be closed so that the melt will be confined and not peter out at the ends. Figure 6 shows the trough closed at the ends with several beads, about 2 inches, of hand weld. The above figure shows another method where steel blocks are hand welded to the trough ends. These are either burned or rounded off after the Unionmelt weld job is completed.

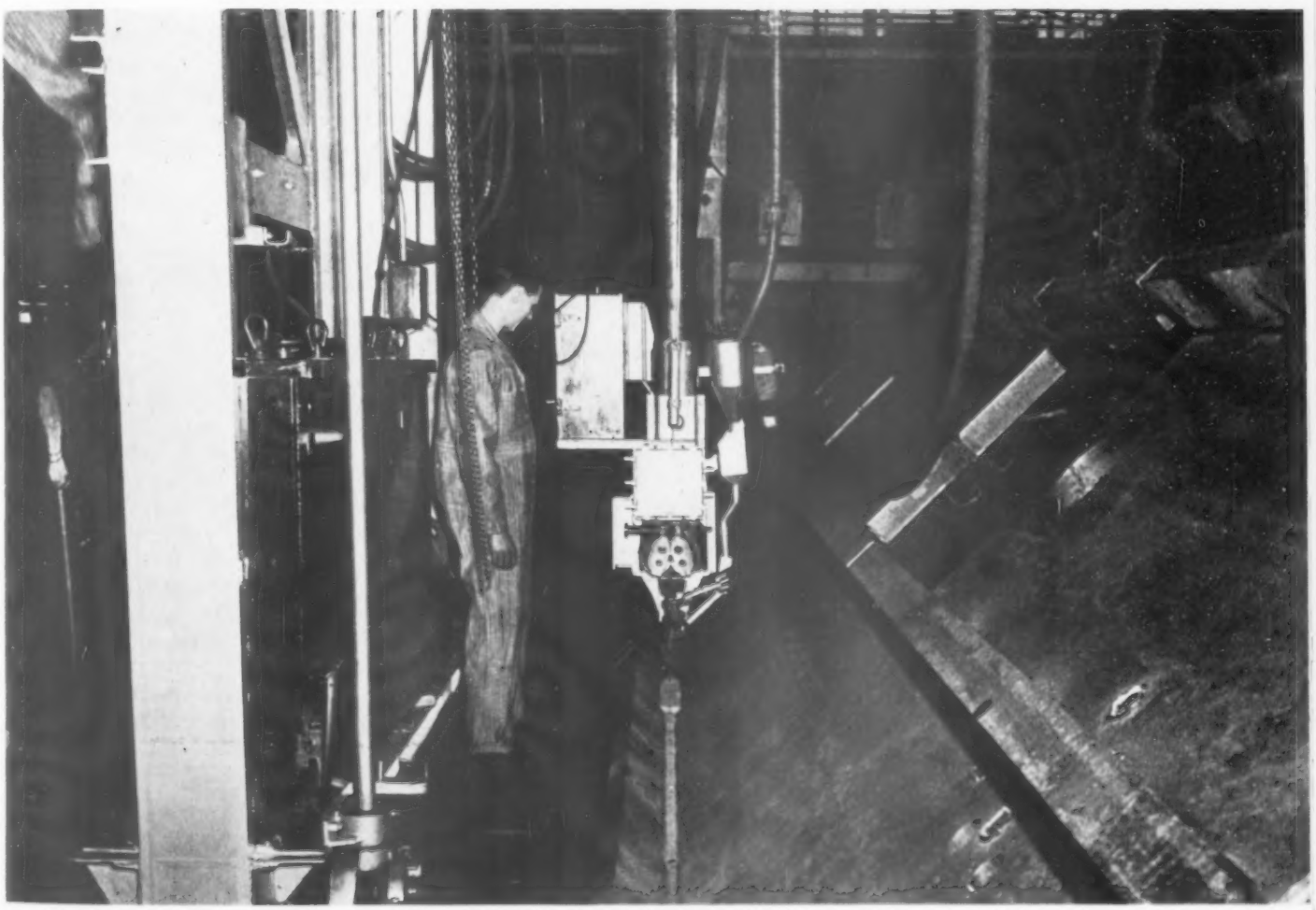
Of course, these are extreme comparisons and, in view of the facts, would be prejudicial without further qualification. Actually, the welding of armor plate (or even of mild steel) may entail one or more beads of hand weld to first close any opening at the joint, as even a minor crack in the butt would let the melt flow through. So, a "root strip" is first laid, which can be either a strip of mild steel welded to both plates, and later chipped out, or a bead of weld which may have to be chipped or cleaned before the Unionmelt weld is applied. So, with regard to the ½" plates, we (editorially speaking) would first lay in one bead of hand weld, also, we would hand weld the joint complete for about 2" from each end (as in Fig. 6), thus closing the ends of the "Trough" so that the melt would be confined and not peter out at the ends. Taking 33 minutes for the single bead, and 6 minutes to close the ends, plus chipping, we would consume about 50 minutes for the preliminary work, to which may be added the 7.7 minutes for the Unionmelt welding—roughly one hour for the job as against 2 hours for hand welding. But even that is a ratio of 2:1 which, in the course of time, would mean a lot more of welded assemblies per time and space units.

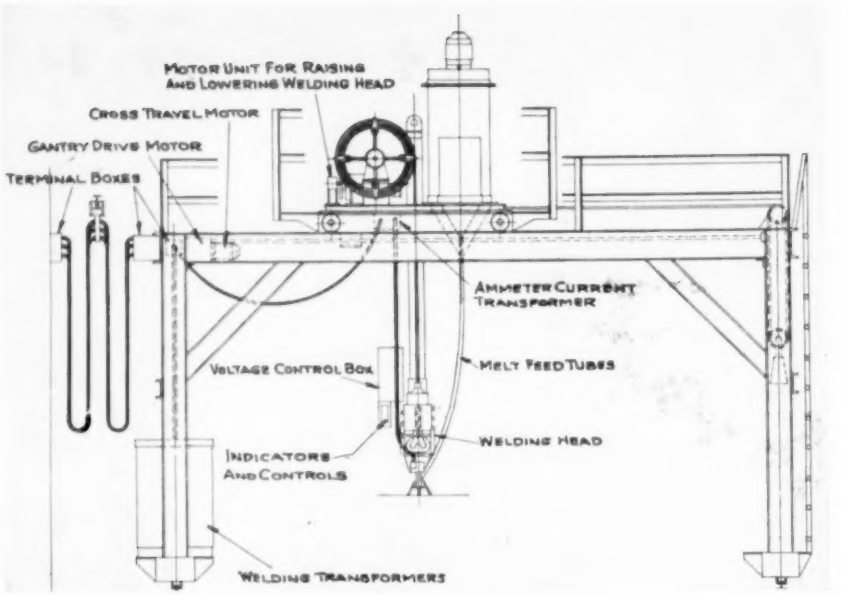
An alternate method of closing the ends of the trough is with steel blocks, welded on as shown in Fig. 7. These are either burned or rounded off after the weld is completed.

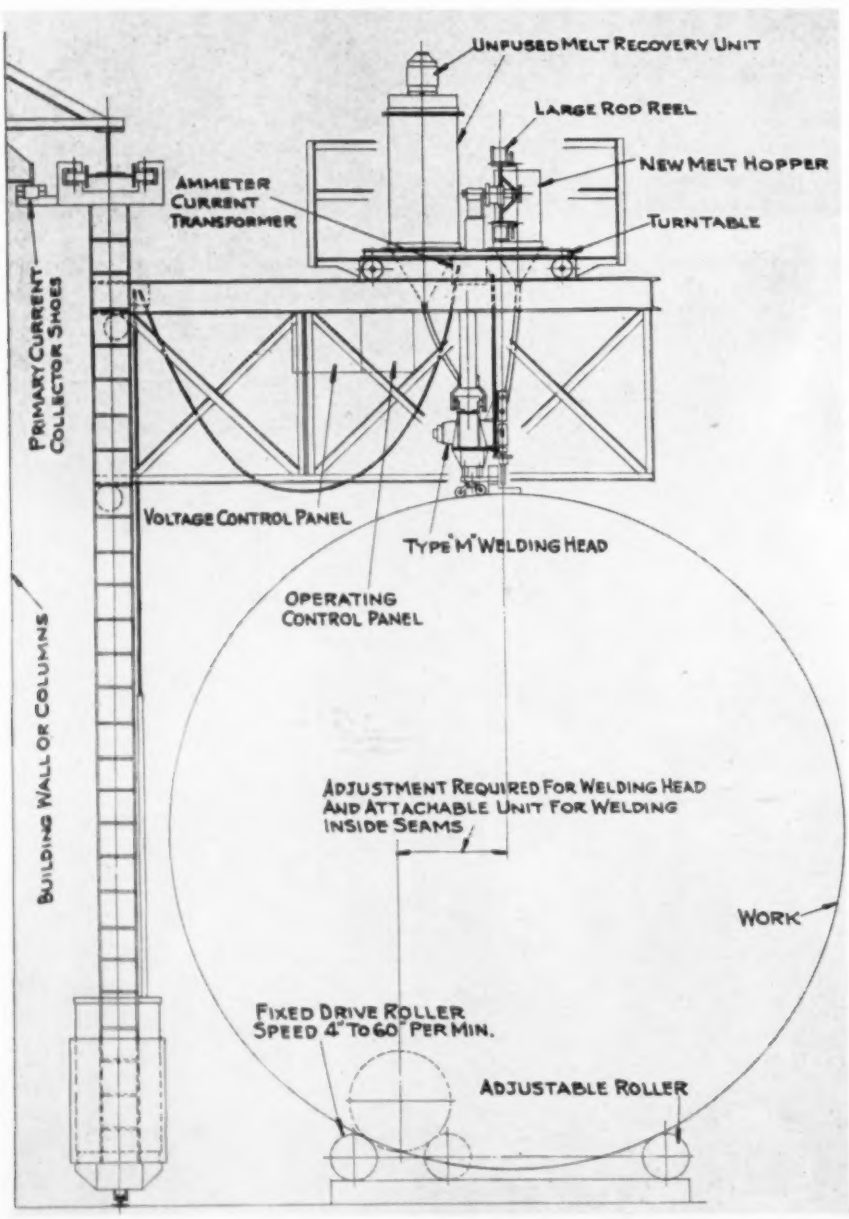
Typical butt welds, as effected with Unionmelt, are shown in Fig. 8, with the dotted lines indicating the original plate edges in each case. Note how the weld penetrates far into the base metal; actually, the term "melt" is aptly used, since there is a very definite fusion between the weld and the base metal. Nor, is there any question whatsoever as regards its place in industrial welding.

Figure 8, next page top, shows typical butt welds as effected with Unionmelt. Dotted lines indicate the original plate edges in each case. Figure 9, at the bottom, shows the tool devised for fillet welding the bed-plate of a switching locomotive. The job is welding a 2-inch by 7-inch stiffener to a 4-inch plate. Rate is one pass at 12 inches per minute.









Figures 10 and 11, a Gantry crane and a wall crane, two completely self-contained units for Unionmelt applications

It has been proven by time and, it goes without saying, is the fastest method of fusion welding so far developed. The manufacturer, however, has been commendably reserved as far as any claim for the welding of armor plate is concerned, nor does the writer care to extoll a method which, while it promises the ultimate in speed, is still in a transitory stage in armor plate welding. If anything, production engineers have rather forced the issue; they see the great accomplishments of Unionmelt in producing ships and see possibilities of Unionmelt for tanks on a mass production scale, and are among its most enthusiastic boosters. In the writer's opinion, it will work on armor plate. It's got to! For that matter, it has been proven out by some users, and all will eventually get into production. Meanwhile, it stands there, the dark horse of the defense program.

The tooling for Unionmelt is interesting and highly diversified, and may be discussed in a later issue of THE TOOL ENGINEER. However, a very interesting—and clear cut—application is shown in Fig. 9, a fillet weld in the bed plate of a switching locomotive. This is being made in one pass at 12″ per minutes 800 amps., 35 volts, with ¼″ welding rod. The job is welding a 2″ x 7″ stiffener to a 4″ plate, the rack, in this case, being overhead.

An interesting but not unusual installation is shown in Fig. 10, a Gantry crane making a completely self contained unit complete with the generator. A similar application, except that it is a wall crane, is shown in Fig. 11. However, each job will likely present its own requirements, and, in that case, the shoemaker to his last. The Welding Engineers have a job to lick, and, considering the zeal with which they have tackled it, have probably achieved success by now. The Tool Engineers, of course, will tool anything that shows promise of manufacture. At least, a Master Tool Engineer—plain Bill Knudsen then—showed that armor plate can be welded.

A Key to Victory

TECHNICAL SESSIONS

In two portfolios, Tool Engineer presents the edited transcripts of the three days of lectures and discussions of the 10th Annual Convention of the A.S.T.E. in St. Louis.

Below, speeches in this issue. Remainder will appear in THE TOOL ENGINEER for June.

- **Cutting Tool Design, and Getting the Greatest Service Out of Cutting Tools**
  A. H. d'Arcambal, Vice-President, Pratt & Whitney Division
- **Salvaging Worn-out Cutting Tools—Usually Thrown in the Scrap Bin**
  L. W. Lang, Sales Manager, National Tool Salvage Company
- **Cutting Tool Life and Cutting Fluids. How to Increase Tool Life and Production with Proper Cutting Fluids.**
  Prof. O. W. Boston, University of Michigan
- **Problems of the Service Influencing Design, Procurement and Production**
  Brigadier General Kenneth B. Wolf, Army Air Corps
- **Manufacture of Aircraft Engines**
  H. E. Linsley, Wright Aeronautical Corporation
- **Excerpts from the Address by Dr. Charles Copeland Smith**
- **What Tool Engineers Asked and What They Were Told**
  Excerpts from the questions and answers periods which followed the lectures.

Cutting Tool Design – and getting the greatest service out of cutting tools

"Cost is only one thing."

A. H. d'ARCAMBAL
Vice-President, Pratt & Whitney Division
Niles-Bement-Pond Co., West Hardford, Conn.

FELLOW members of the American Society of Tool Engineers and guests:

Last year the machine tool builders turned out close to eight hundred million dollars worth of tools for American industry. But our Government said, "Men, that's not enough. You'll have to double your production in '42."

So, this year, the machine tool builders expect to ship one billion, five hundred million dollars in machine tools, the majority of which are for American plants, and when you consider that the majority of these new tools, and well over a million of the older tools are now running the clock around, seven days a week, you can understand the unprecedented demand for cutting tools.

The Working End

As you know, the cutting tool is the working end of the machine. Your machine is useless without proper cutting tools.

Many plants now realize the necessity of training men as to the proper use of cutting tools and the correct method of grinding. Some plants have charts up on various bulletin boards, showing typical tools, such as ground thread taps, milling cutters, drills and reamers, and underneath each, in nice print, the price of these tools.

You know, a lot of operators see so-called taps and dies in the dime stores, and when they note that a high speed steel ground precision thread tap cost a dollar or more they can't believe it. That is one method of educating and letting them know they cannot afford to break these tools.

Cost is only one thing. Another plant has a very interesting board showing the proper manner of regrinding tools, as well as the wrong way with resultant burned cutting edges and improper angles. Other cards stress tool conservation and the important role played by cutting tools.

Making Tools Last Longer

We are now going to make a few suggestions that should make your tools last longer. First, of course, obtain the proper designed tool for the job.

Because we have so many new types of materials being machined on a tonnage basis today, such as magnesium, aluminum alloys, alloy irons, heat treated alloy steel, stainless steel, plastics, etc., you cannot take a stock tool from the shelf and obtain maximum cutting service on all these different materials. Where you are machining a special material on a production basis, specify on your order to the tool manufacturer the material you are machining. This is most important.

A large number of the cutting tools made today are special, due in part to the many different materials regularly machined requiring a specially designed tool.

Say you are milling magnesium, and your purchasing department ordered regularly listed cutters from the trade catalog. These cutters would give no service whatsoever as cutters for use on magnesium have only ⅓ to ½ the number of teeth of regularly listed cutters, are provided with high rake and clearance angles and must have smooth surfaces.

In the case of taps, if we know they are to be used on aluminum, we provide same with ten to fifteen degrees rake on the cutting edges and highly polished flutes. Taps for use on magnesium also have pronounced rake angles, smooth cutting surfaces and at times are furnished slightly larger than standard practice due to the metal closing in.

And so with all of the different materials machined on a tonnage basis, unless you let the manufacturer of the tools know the materials to be machined, you are not going to get the most efficient design of tool for the job.

Proper Use of Tools

In regard to the second factor, the proper use of tools, one must employ the correct type of machine, efficient tool holding devices and the proper speeds, feeds and cuts, as well as the correct type of cutting fluid.

In many cases high speed steel tools are not being run fast enough.

High speed steel taps in some plants are run at carbon steel speeds of thirty or forty feet a minute. Increasing the speed to 60, 80 or even 100 ft. per minute on some jobs, results in better threads and longer tool life.

We ran into a case recently where a customer was experiencing trouble with high speed steel chucking reamers used on heat treated alloy steel in the neighborhood of 300 Brinell. The cutting edges of these reamers were dulling badly after producing only 5 to 6 holes in this hard material. At the suggestion of the visiting Tool Engineer the speed was increased from 40 to 80 ft. per minute and a better flood of sulphur base cutting oil employed, resulting in these reamers being in excellent condition after producing 40 holes.

All of the carbide tool manufacturers today state that carbide tools must run at very high speeds if one is to obtain proper tool life and satisfactory finish. This statement applies to all different types of materials machined with carbide tools.

Should time permit we could cite many more cases where operating tools at the proper speeds has resulted in increased efficiency.

It is also quite a common fault to remove too little material when reaming. Quite often customers complain about the life of reamers and on investigation we find that the reamers are only removing .001 to .002 of metal, and by increasing the amount of stock removed up to .008 to .010 the reamer life is vastly improved. Give the reamers a chance to cut instead of merely scraping off the metal.

Unfortunately there is no fixed rule regarding the speeds, feeds, cuts to employ on the many different materials being machined. Most of the shops find it advisable to conduct actual tests in order to determine the most efficient speeds, etc., to employ.

Climb Milling

Now just a word as to climb milling. Manufacturers of modern milling machines recommend climb cutting on many machine operations, these new design milling machines being so designed as to eliminate backlash. Climb milling properly employed results in greatly increased production, better finish and much longer tool life. One of the large manufacturers of thread milling machines recommends climb milling on practically all operations whether using single or multiple thread cutters. These machines are equipped with a brake or drag on the work spindle which removes all backlash, offsetting the natural tendency of the cutter to dig in on this type of cut. This spindle drag is entirely automatic, operating during the cut only, being disconnected automatically when the rapid traverse is in use, thus requiring no attention by the operator.

Uses 90% Climb Milling

Mr. Roy T. Wise, Deputy Machine Tool Controller of Canada, featured climb milling in his splendid address delivered at the Semi-annual Meeting of our Society in Toronto last Fall. He cited a case of one manufacturer of drills and reamers that is employing climb milling on 90% of all the milling operations in that plant, with splendid results as compared with conventional milling.

The important role played by cutting fluids in connection with tool life and finish will be ably discussed by Prof. Boston during the morning's session.

The proper care of cutting tools of all types is receiving more attention today. It is most gratifying in visiting many of our large war plants to note the central tool grinding cribs where all tools are properly re-ground by experts provided with the best grinding equipment. By following the rake and clearance angles originally provided on tools and the use of proper grinding wheels, these tools on re-grinding give the same good life as that experienced when received from the tool manufacturer. The Norton Company in Worcester deserves great deal of credit for their educational work with the manufacturers of this country in regard to the re-grinding of tools, publishing several worthwhile booklets on this subject. It is common knowledge today that the grinding finish given cutting tools is an all-important factor in regard to tool life and performance. The better the grinding finish the longer the life of the tool and the better the finish obtained. Tools should be machine ground whereever possible as it is extremely difficult to properly hand grind.

As an example of the effect of grinding finish on tool life, let me tell you about the high speed steel rifling cutters, so greatly in demand today which our company is manufacturing in large quantities. We have found that by providing the face of these cutters with a very high finish using special grinding wheels, the life of these cutters has been greatly improved.

As another example I might cite a case recently reported by one of our large aircraft engine manufacturers. They have been manufacturing a certain design of turning tool in their plant used on a fairly difficult machining job. These tools averaged approximately 40 pieces per grind, the grinding being done by hand, and with ordinary grinding wheels. By changing over to machine grinding in order to insure the correct rake and clearance angles and then stoning the cutting edges, these tools are now averaging well over 100 pieces per grind.

We cannot over-emphasize the importance of correctly regrinding tools of all types if one is to obtain maximum tool life, so important during this critical period.

Tool Storage

It is also interesting to note the care being used by many of our manufacturing plants today in regard to the storage of tools. The cutting edges of these precision tools are carefully protected, resulting in these tools being in excellent condition when taken from the crib. Contrast this with the method formerly employed by many plants of throwing tools on top of each other in bins, resulting in many of these tools having chipped or nicked cutting edges when ready to place in service again.

The cutting tool manufacturers in this country have greatly improved the quality of their product during the past decade. Tools are made to closer tolerances with much better grinding finishes and in the case of certain tools like high speed steel reamers, given a special nitriding treatment, resulting in at least double the life obtained from tools given the usual hardening treatment.

Select the proper tool for the job; use these tools correctly and give tools the proper care, especially in connection with the regrinding operation, and you will greatly lower your tool cost as well as turning out a better quality product.

Salvaging Cutting Tools *usually thrown in the scrap bin—*

LARRY W. LANG
National Tool Salvage Co., Detroit, Mich.

"Only the best tools are salvaged."

THE salvaging of cutting tools is a highly specialized business entailing considerable skill and responsibility.

American industry in the metal working trades can be grouped into four classes; those who are convinced of the merits of cutter salvage and who practice it; those who do it themselves by annealing, remachining and rehardening; those who *think* they do it themselves, but who in reality only seek the last possible grind by expensive and improvised methods of their own, usually missing their objective by some margin, and those who turn a deaf ear to the whole proposition. We are concerned mainly with the first group.

The present process of cutter salvage by grinding was originally conceived of as a job requiring not only specialized equipment, but especially trained personnel as well. It was something to be handled apart from individual tool rooms because none but the very largest of shops could supply enough such work to keep the needed equipment busy and thereby justify the investment. The originator of the process, R. M. Nicolaysen, a college-trained engineer, is a senior member of the A.S.T.E., Detroit Chapter No. 1, and plant engineer of the company I am identified with. He started in this business in 1912. The process is no secret and our shop has always been open to interested visitors.

About 80% of our equipment is of special design, built either by us or for us. An example of how we have solved individual problems is shown on our special machines for gumming our teeth. We originally built them with ball bearing tables. The design however necessitated excessive table length so we went to endless roller chains, a design which was adopted several years later by machine tool builders for standard cutter grinders.

Cylindrical grinding is done wet. This includes sizing of drills and reamers, shank work, and spinning, or truing up, on the O. D. Spinning, or cylindrical grinding on the O. D., is done on all cutters as the first operation, to remove high spots which always exist on cutters which have been repeatedly used and sharpened. From there on all steps are done dry, except the final dipping in oil. Centers, either male or female, are ground where needed. Female centers are made to receive standard male centers and special test gages are in the hands of the machine operators as well as final inspectors. Teeth are gummed out on special equipment which takes one cut and moves on to the next tooth, going around and around until proper depth and shape are established. Tooth form or shape of backoff is accomplished partly by position of fixture and partly by wheel dressing.

We cannot reproduce teeth relieved on a form, and we cannot alter existing form relieved teeth. But contour ground teeth can be handled over a quite wide range with relative simplicity except where design is complex and time is needed to make templates. Ths type of cutter has become quite popular lately and is being used to a considerable extent in plants building small arms. One advantage in this type of form tool is that finer teeth can be used. This helps in the production of small light parts. Also slight changes can be made if necessary without the necessity of starting again from scratch. Grinding must be precise and exact, and inspection of finished parts must be rigid enough to detect any variation which would affect interchangeability.

Taps cannot be salvaged to change size or thread. We cut off damaged ends and regrind the chamfer, grinding the flutes if needed and index sharpening the existing teeth. Up to a year ago it had been impossible to discover a tap salvage market which would yield enough to fill your hat. Now they can be had by the ton, but there is no equipment to do thread grinding, especially *relieved* thread grinding, in the salvage industry, as far as I know.

Apart from form relieved cutters, practically any arbor or shank type cutting tool can be restored to new tool condition, subject to the limitations imposed by the remaining metal in the worn or damaged tool. It is fundamental, except in rare instances, that tool size and condition must lend itself to profitable reconditioning. Therefore very small tools, or worn or damaged tools which would result in very small finished dimensions, are not salvagable. For example, it is commercially impossible to recondition twist drills below ½" O.D.; end

make below ¼" O.D.; on reamers this minimum ¼" because when set on centers, the reamer tends to yield under the needed pressure of the grinding wheel and extreme accuracy of finished O.D. is difficult to attain.

It is a practice to finish tools to the manufacturer's original tooth shape and limits. Solid end mills with worn or broken ends are recentered and recounterbored. Shell end mills are recessed for proper clamping screw space. Tangs are restored and shanks cleaned up whenever damaged or scored. Saws which show the effects of binding are hollowground on the sides, and so on through the list of defects which tools present when received.

Carrying this policy into the field of shank type tools, shank sizes or tapers are not changed except on order, regardless of the changes which may have occurred in the fluted section. But changes *can* be made in sizes, even in design, on quite an extensive scale. For example, plain mills can be changed into side mills, either regular or staggered tooth, and of course regular side mills can be changed to spiral alternate teeth. Combination center drills and countersinks can be recut where either or both tips have been broken off. Counterbores or spotfacers can be restored, usually without change of O.D.

These particular tools often seem to suffer more in the tool room than in shop operations. It is general practice to so grind for chip room as to compel the packing of chips against the pilot, thereby ruining them as production tools.

Saws can be provided with side chip clearance teeth, drills and reamers with steps; subland or multi-diameter drills can be produced from standard twist drills; tapered or straight roughing reamers, with or without steps, can be made from three or four-flute drills; spiral or helical slab mills from worn out hobs; shell end mills from slab mills or hobs; solid end mills from shank type thread milling hobs; slab mills can be made into interlocked side mills. Also, arbor holes can be either enlarged or bushed, and new or different keyways can be ground. It is often possible to save an expensive cutter which has started to crack from the corner of its keyway by relocating the keyway and thus transferring the driving strains to another area. Old standard keyways can be ground to present standards.

On some of these jobs, especially where small sizes are involved, conversion cost may result in no financial gain over the purchase of new, but the time element may still make it attractive.

In standard practice, most tools are finished to accepted standards of tolerance, degrees of relief, degrees of back taper and widths of lands.

An earnest effort is made to improve tools for their known use, particularly on special tools. To quote a recent trade paper article:

> "An example of what efficient reclamation means is the case of a special cutter used on the continuous feed drum-type milling machines. When new, it is 5½" O.D. by a-¼" thick. Originally, including the one recut which was possible, an operator produced 150 to 160 pieces per grind, and the life of the tool was good for about 7200 pieces. Through cooperation by tool design and machine shop supervision, the cutter was redesigned so that three recuts are possible. An operator can produce 450 to 500 pieces per grind, and the life of the new redesigned tool is good for approximately 36,000 pieces."

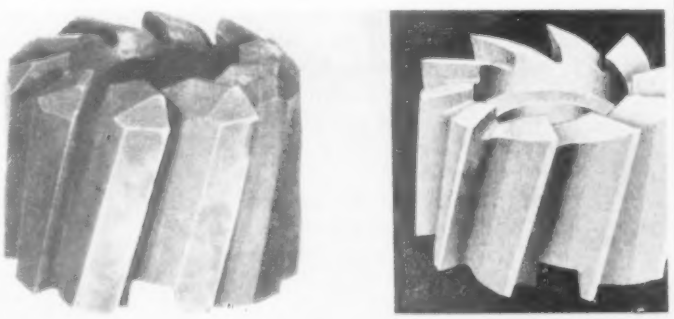
A few weeks ago, a gun maker asked, "When should a cutter be taken out of service for recutting?" One answer to this has been worked out by a builder of milling machines who does not make cutters and whose approach to this question was with a view to getting maximum production capacity. Their findings indicate that after a cutter has lost 35% of its original tooth height, its efficiency diminishes rapidly and its continued use results in less and less production as the teeth get shorter. This disregards the risk of total destruction which often results from trying to get the last grind out of a tool.

Given the stock on which a tool is to be used, or any unusual facts of application, salvage operators automatically recut according to the best known design or tooth shape for that purpose.

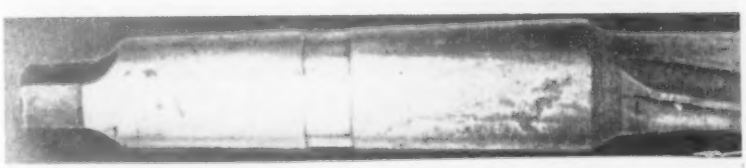
In April, 1941, the late Ford Lamb wrote me, "It might well be that many defense items can remain in production because of your ability to provide tools from existing material during these times when new material is seriously delayed or unobtainable."

Only the *best* tools are ever salvaged, for the weaklings fall by the wayside. You know what to expect from a recut tool, because you have worn it out at least once.

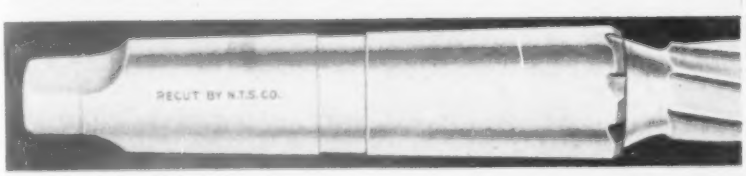
Salvaging tools—before and after



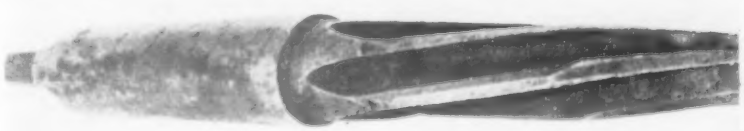
Milling cutter



End mill



Reamer



Cutting Tool Life

and cutting fluids

O. W. Boston, professor of metal processing and chairman of the Department of Metal Processing, University of Michigan, is also chairman of the A. S. M. Committee on Machinability of Steel, and a member of several other active committees. He is author of numerous books dealing with metal cutting and machine tools. Material presented in this article was given as a slide lecture at the A.S.T.E. Convention. The article has been arranged so that the text of each page deals with the illustrations on that or an adjacent page, preserving the close relation of the speech to the slide pictures.

O. W. BOSTON

Professor, College of Engineering, University of Michigan

ANY discussion of cutting fluids must touch upon the more comprehensive subject of machinability to show the relationship of cutting fluids to processing as a whole. Machinability comprises such factors as the material cut, cutting tool, and cutting fluid. Long tool life, low power consumption, good surface finish, well-broken-up chips, and dimensional accuracy all may be desirable, or any one of these five factors may predominate in a given case. It is best to rate the machinability of a metal on each factor independently, or give a general over-all rating based on that of other metals. Because of these many involved factors, ratings given by various authors do not always agree. Neither does the rating of a metal based on possible cutting speed always agree with ratings for the same metal based on capacity to give good surface quality. In fact, a metal seldom gives a rating of equal value when based on each of these factors.

These conclusions result from thousands of tests run to develop a metal which would simultaneously provide high ratings in all factors. Also, it has been found true that the rating of a cutting tool depends very largely upon the metal being cut, the tool shape, the cutting fluid, etc. Even the value of a cutting fluid will vary with different specific processes, cutting tool shape and material, size and shape of cut, and method of application.

To classify terminology used in this discussion, Fig's. 1, 2, and 3 represent nomenclature as set up for single-point tools by the American Standards Association. These terms are used interchangeably where possible with other types of cutting tools.

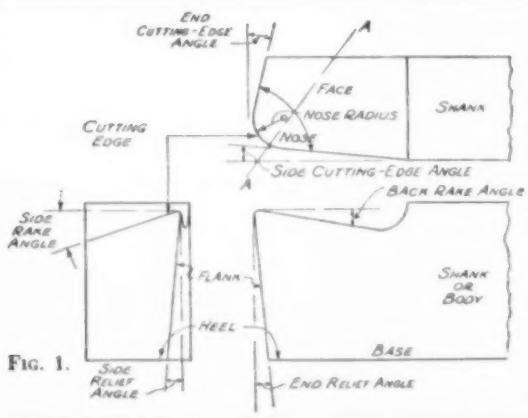


FIG. 1.

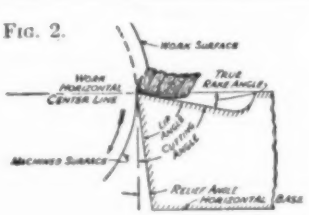


FIG. 2.

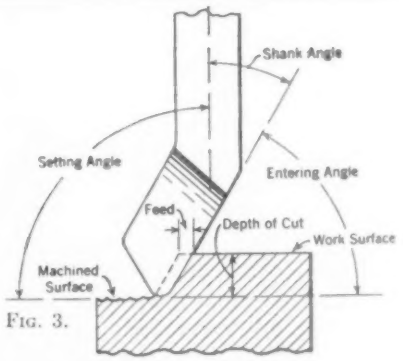


FIG. 3.

Fig. 4—Chip when turning low-carbon steel (0.22 percent C) after the work was suddenly stopped.

Chip Form and Tool Wear

In the metal cutting process, surface quality of the machine surface is affected by several different factors, namely, cutting speed, tool shape, size of cut, process of cutting, and cutting fluid.

To illustrate the principle by which chips are removed, a tool was suddenly stopped while turning a low-carbon steel in a lathe at 44.5 fpm, using a feed of 0.040 ipr and a depth of cut of 0.125 in. This tool had a character of 8-14-6-6-6-15-3/64 which means 8-deg. back rake, 14-deg. side rake, 6-deg. side relief, 6-deg. end relief, and 6-deg. end cutting-edge angle, 15-deg. side cutting-edge angle, and 3/64-in. nose radius. The chip and its junction to the log is shown in a radial view at the top in Fig. 4.

It frequently appears that a tear between the test log and the junction of the chip separates the chip from the work. This appearance is usually only on the surface. In the view at the bottom, Fig. 4, the shiny base of the built-up edge, which has been supported on the face of the tool, is clearly visible. If the outside surface of the test log at this junction is ground off so as to form a plane passing through the chip, test log, and built-up edge, a section similar to that shown in Fig. 5 is disclosed. This shows the original log material at the bottom with the material compressed and sheared into the shape at the right as it slides upwards over the built-up edge, and in most cases over the face of the tool.

The work surface is formed not by the actual scraping or cutting action of the lip of the tool, but by the leading point of the built-up edge some distance ahead of the tool cutting edge. Frequently, parts of the leading point of the built-up edge slough off and adhere both to the work surface (and to the underside of the chip), to form small steps producing a surface similar to that of the face of a file. Fig. 5 illustrates both of these conditions which are occurring at normal cutting speeds for high-speed-steel tools.

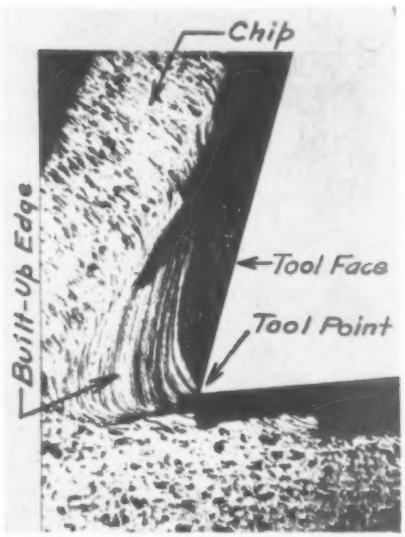


Fig. 5—Built-up edge formed in annealed low carbon steel.

If the speeds are very low, a different form of broken-up chip is normally obtained as discussed later. If the speeds are unusually high, the built-up edge recedes from the cutting edge of the tool, and the cutting edge actually does the cutting so as to leave a truly scraped or cut surface as the machined surface. This condition normally is obtained with cemented carbide tools.

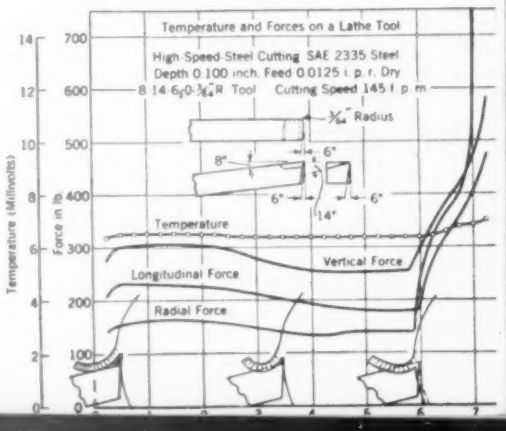
Because of this form of chip, the tool is worn to failure, as illustrated in Fig. 6. The tool form and cutting conditions are shown in the upper part of the Figure. At the start of the cut, the tool is newly ground, and a built-up edge is formed which rests on the tool face. After cutting for about 3½ min., the chip has worn a groove in the face of the tool after sliding over the built-up edge. This built-up edge is supported on a narrow ridge immediately back of the cutting edge, and protects the cutting edge.

After cutting for 6 min., the groove in the face of the tool has been worn deeper, and the flank of the tool has also been worn, as illustrated by the sketch. It is in this condition that the tool is cutting most efficiently. The cutting force represented by the vertical, longitudinal, and radial force components are seen to be maximum at the start of the cut when the tool is freshly ground, and least at about 6-min. tool life.

The cutting edge at the 6-min. tool life is now actually separating the chip from the work. It is irregular, resembling a range of mountains. One peak after another will break off, but until the cavity is large, it will be filled by work material to form a small built-up edge, and continue cutting for some time, presumably from the four- to six-minute cutting time as illustrated. These failures, known as preliminary failures, are frequently evidenced by small burnished lines on the cut surface which change the nature of the machined surface. They may occur along the side cutting edge so that the burnished line is observed along the shoulder of the work being cut.

Where this preliminary failure is objectionable because of the change in character of the machined surface, the tool may be ground to a different shape and cause these preliminary failures to occur on the side cutting edge rather than on the end. At the six-minute tool life in Fig. 6, the irregular cutting edge suffers a major collapse as is evidenced by the sudden increase in cutting forces, and also by the surface quality of the work.

Fig. 6



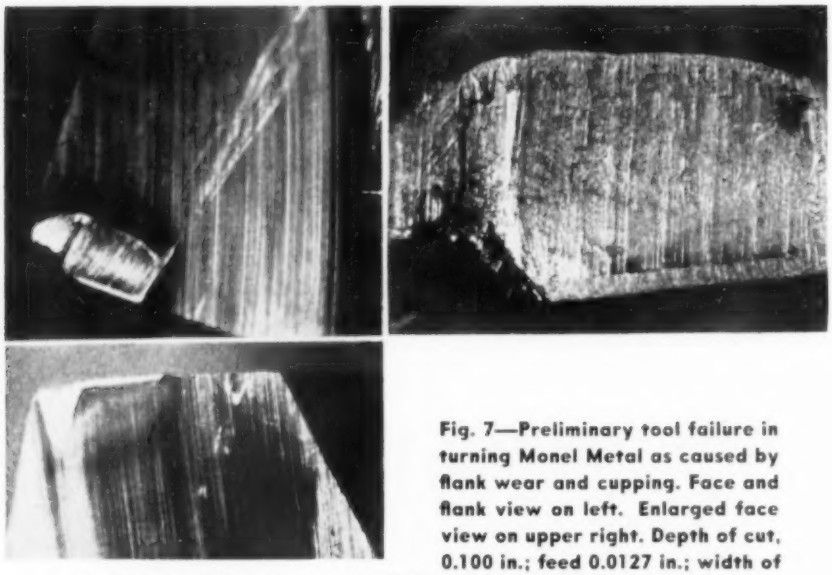


Fig. 7—Preliminary tool failure in turning Monel Metal as caused by flank wear and cupping. Face and flank view on left. Enlarged face view on upper right. Depth of cut, 0.100 in.; feed 0.0127 in.; width of land supporting built-up edge, 0.0044 in.; the width of crater from the land, 0.05 in.; and the width of the land worn on flank, 0.004 in.

Two views of a tool, after having failed when turning Monel metal, are shown in Fig. 7. The upper view shows the face of the tool in which the crater has been worn. The land supporting the built-up edge is seen just back of the cutting edge. Grinding marks on the land seem to be continuous with those on the face on the other side of the crater indicating a more or less permanent main portion of the built-up edge.

The lower illustration shows the flank of the tool below the active cutting edge. The small narrow ridge is a portion of the flank which has been abraided. The V-shaped notch at the tool point shows how the flank below the nose is abraded when the tool fails. It is seen that the tool has worn progressively by cupping on the face and abrading on the flank. The deep abrasion below the nose is caused quite suddenly at the instant of tool breakdown.

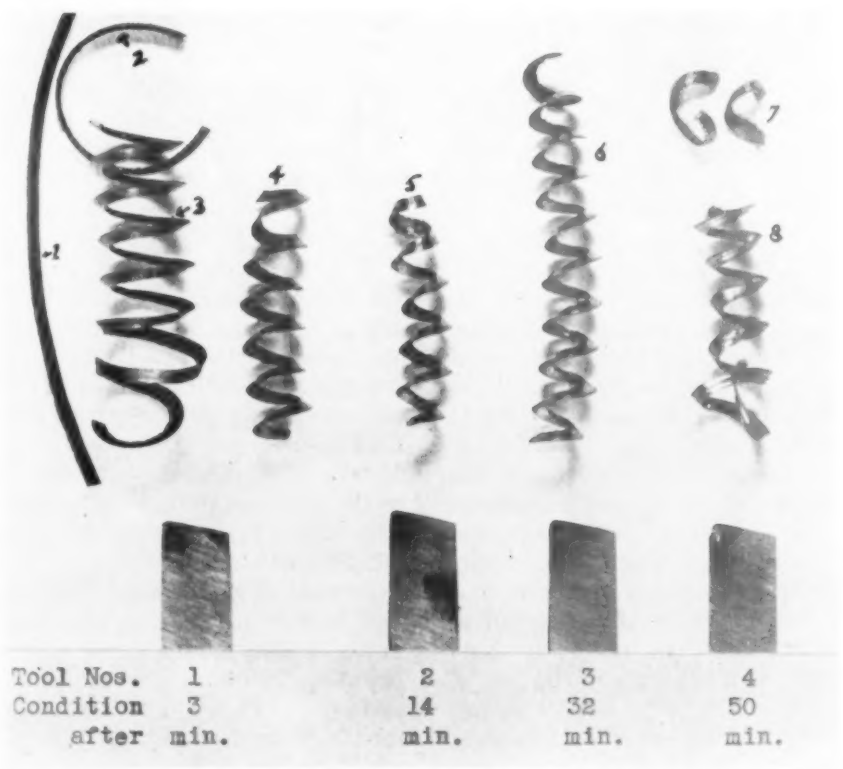
Many times, tools fail only by cupping on the face. During the course of wear, the cup becomes larger and larger, and the land supporting the built-up edge narrower and narrower until the land no longer has sufficient strength to support the load and carry away the heat. It then fails abruptly. Many other types of failure involve only flank wear. This occurs when high-speed-steel tools turn cast iron. Tool failure is noted in this case by a loss in depth of cut, or an excessive rubbing between the worn flank of the tool and the shoulder of the work being cut. A point is evidently reached when the excessive heat generated causes the tool to fail.

Figure 8

As a newly ground tool starts to cut, the chip is usually in the form of a long straight ribbon, as indicated by chip No. 1 in Fig. 8. As cupping on the tool face progresses, the chips become coiled helically and sometimes spirally. These helices are also continuous for a time, and become smaller in diameter as tool wear progresses. As the cup becomes deeper, the chips become smaller in diameter and usually of shorter length, as shown by the successive steps in Fig. 8. At the time of failure of the cutting edge, the chips become blue, indicating excessive heating, and have a torn or split appearance.

In this way, the time of tool failure can be determined by observing the form of chips. The long straight chips, as shown at No. 1, are difficult to handle. Further, they are removed at high speed, are sharp and hot, and a danger to the operator. They are also apt to become tangled in the machine or work, and mar the machined surface. The coiled chips are therefore desirable, so this type of tool wear is advantageous.

Fig. 8—Chip formation as influenced by tool wear when cutting SAE 1045 steel.



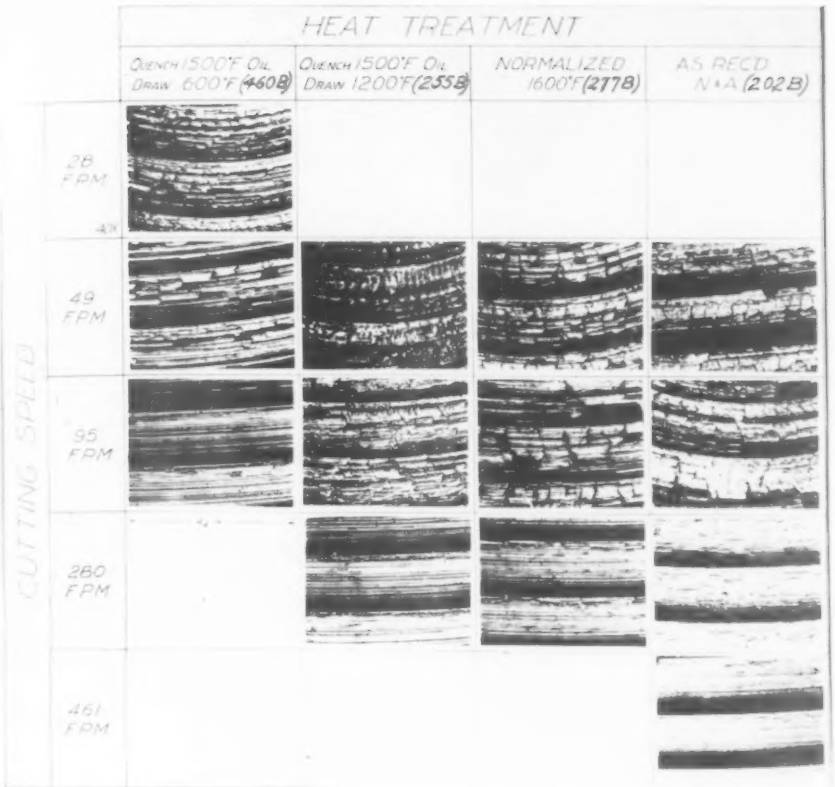


Fig. 9—Surface finishes on SAE 3140 steel machined dry at various speeds at 0.0035 in. Feed, 0.0625 ipr.

Surface Quality vs. Speed

It is commonly known that the cutting speed greatly influences the quality of the machined surface, even independently of the size of cut, tool shape, and other cutting conditions.

To show that the surface quality varies with speed, even for materials of different structure, four disks were prepared of an SAE 3140 steel. These disks were 5-in. in diameter and ½-in. thick. They were heat-treated as indicated in the upper part of Fig. 9 to give the Brinell hardnesses of 460, 255, 277, and 202 respectively. The disks were chucked in a lathe and faced with a cemented carbide tool having a shape of 6-6-6-6-6-0-1/16 in. The cuts were made dry using a depth of 0.0035 in., and a radial feed of 0.0625 in. The tool was fed from the center radially outward so that as the work rotated at a constant speed of rotation, the peripheral cutting speed was increased from zero to a very high value.

Photographs of the surfaces at a radii to give the cutting speeds of 28, 49, 95, 280, and 461 fpm were made. They were grouped for comparative purposes in Fig. 9. The surface quality on the disk quenched at 1,500 deg. F. and drawn at 600 deg. F., having a Brinell hardness of 460, is poor at 28 fpm, but appears to have an optimum speed at 95 fpm. By optimum speed is meant in this instance the minimum speed at which the built-up edge recedes from the cutting edge of the tool, allowing the cutting edge actually to produce a clean-cut surface. The steel quenched at 1,500 deg. F. and drawn at 1,200 deg. F., having a Brinell hardness of 255 appears to have the optimum speed at 280 fpm.

This compares favorably with the optimum speed for the disk normalized at 1,600 deg. F., having a Brinell hardness of 277, although it is believed that the optimum speed for the normalized disk should be slightly lower at 248 fpm. The optimum speed for the normalized and annealed bar, having a Brinell hardness of 202 as shown in Fig. 9, is approximately 461 fpm.

This indicates that a good surface quality can be obtained on a steel in any heat-treat condition if the optimum speed is reached, but that the optimum speed to produce this best finish is lower for the harder steels.

Surface Quality vs. Cutting Fluids

Cutting fluids comprise liquids, solids, and gases, which are applied to the tool point to facilitate the metal cutting operation. Millions of gallons are used annually to accomplish any one of a number of purposes, singly or in combination, such as to increase the tool life for a given cutting speed, prevent distortion of the work while it is being machined, break up the chips and help remove them, and improve the smoothness of the machined surface. The performance of a cutting fluid, therefore, must be based on its success for each particular application to a specific metal, tool, and cutting operation.

In a recent study of the effect of cutting fluids on the built-up edge, a number of specimens of low-carbon steel ¼ in. wide, ½ in. deep, and 6 in. long were used. They were placed in a shaper and a chip was removed from the upper edge of the specimen by an end cutting tool having a 15-deg. back rake, with no side rake. The depth of cut was 0.020 in., the shaper making nine 6½-in.-long strokes per minute (an average of 10 fpm.) The machined surfaces of the work were submerged in each of ten cutting fluids.

There is quite a variation in the quality of the surface for the different cutting fluids at this low speed. The best surface obtained is with the carbon tetrachloride. Under the same conditions, the cutting speed was increased to 82 strokes per minute to give an average cutting speed of 90 fpm. The surface quality produced at this higher speed does not vary so much for the various oils as it does at the lower speed; in fact, there is very little difference in the quality of the machined surface produced by the different cutting fluids.

The bars, in both cases, were so placed in the shaper vise that the cutting tool did not overrun the end. This left the chip and its built-up edge attached to the end of the bar so that it could be cut off, mounted in Lucite, and the side face polished and etched for examination.

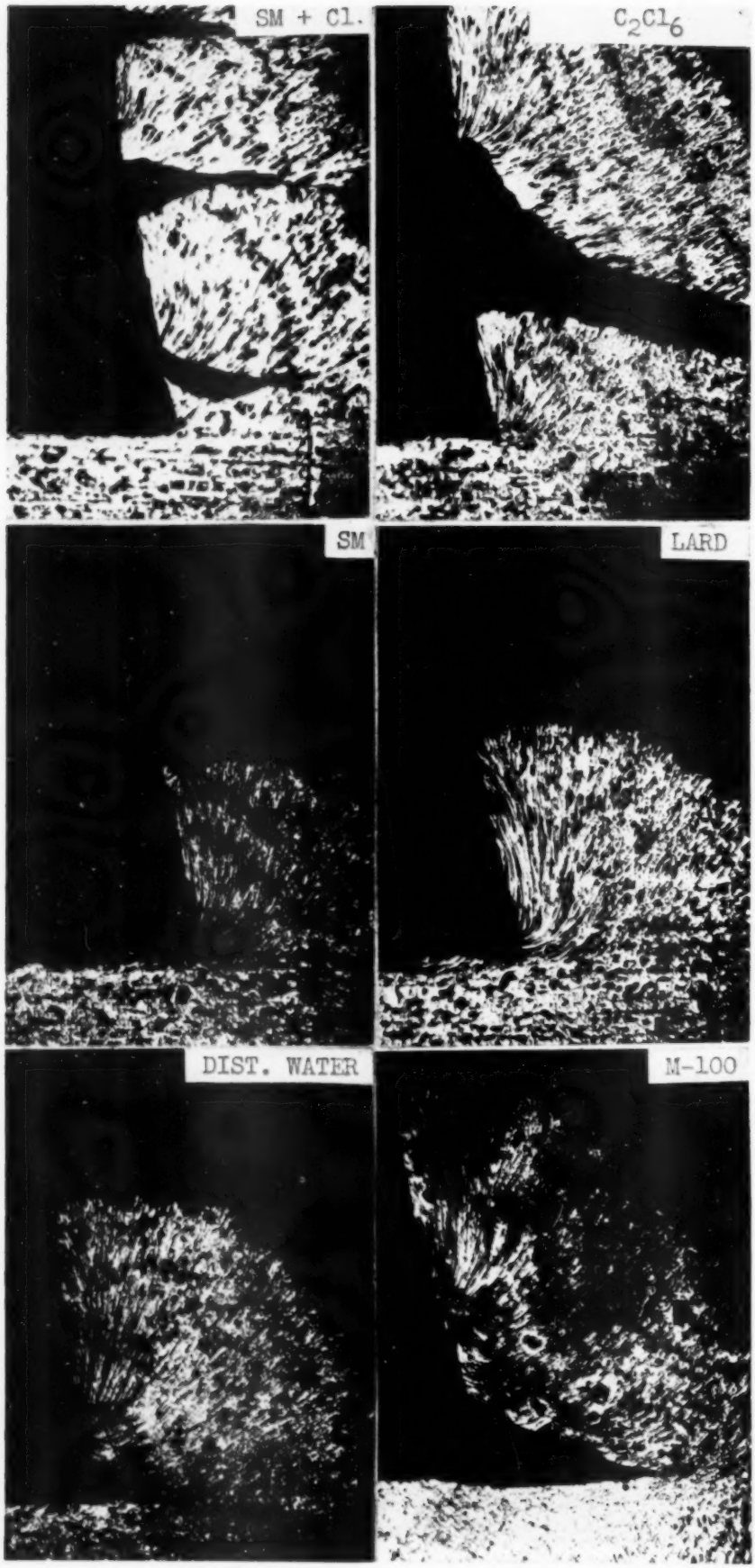


Fig. 10—Chip formation (built-up edges 25x) produced in low-carbon steel with the different cutting fluids indicated. The end-cutting shaper tool had a 15° rake. Depth of cut was 0.020 in., making 9 strokes per minute each 6½ in. long.

Fig. 10 represents the condition of the built-up edge and chip formation for the various cutting fluids when operating at the low cutting speed of nine strokes per minute, 10 fpm. While these chips are discontinuous, that is of the segmental type, it is seen that there is a definite built-up edge in the formation of the chip. The figure at the upper left, in which a sulphurized mineral oil plus chlorine was used as a cutting fluid, shows the beginning of the chip formation. One segment has just been sheared off to relieve the pressure on the face of the tool, and the cutting edge scrapes over the surface and is just starting to pick up the second segment.

The figure on the right, in which carbon tetrachloride was used, shows the chip formation slightly advanced. The segment just removed in this case is shown above. The figure in the center at the left is the chip form in which a sulphurized mineral oil was used, while that on its immediate right is for lard oil. Distilled water and a light mineral oil having a viscosity of 100 at 100 deg. F. were used as a cutting fluid in the formation of the chips at the bottom. In the lower right corner, the whole segment is about to be sheared off from the work, at which time the new segment will be formed, as shown in the upper left illustration.

From this study, it was concluded that while the chips at low speeds are of the segmental type, there is a built-up edge which is formed on the face of the tool but which, with a large portion of the chip, slides off to form a segment. The size of these segments is a function of the depth of cut and of the feed. There does not appear to be much difference in the formation of the segments for the different cutting fluids. The outstanding difference, however, is that the chip formed with the use of carbon tetrachloride has been more continuous than the others. These segmental chips allow the tool face to be lubricated at frequent intervals of space and time.

All of the chips formed at 82 strokes per minute, 90 fpm, were of the continuous type, and were formed by built-up edges on the face of the tool, such as that shown in Fig. 5 which was obtained in these tests by the use of lard oil. Very little differ-

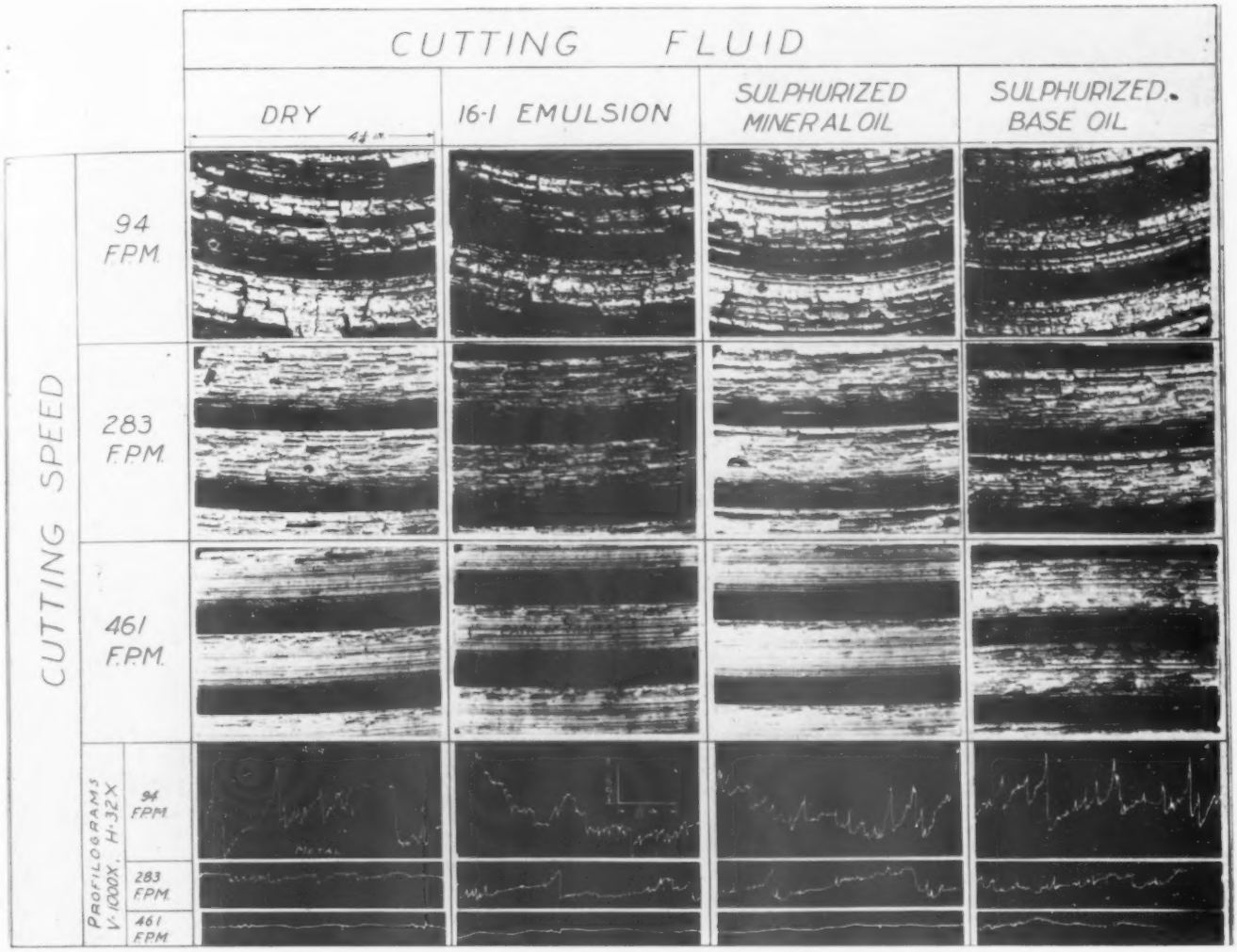


Fig. 11—Surface finishes on normalized and annealed SAE 3140 steel. The cuts 0.0035 in. deep, 0.0625 ipr feed, were made dry and with three different cutting fluids. As can be seen, surface quality is shown to be poorest at the lowest speed, and best at the highest speed for all the cutting fluids.

ence in chip formation was found for the various cutting fluids or when cutting dry. The smallest built-up edge was obtained with carbon tetrachloride, although it was only slightly smaller than those obtained with the other cutting fluids.

Figure 11

In another set of experiments, disks of SAE 3140 steel, 5 in. in diameter and ½ in. thick, were faced in a lathe under conditions similar to those used in connection with Fig. 9. These disks were all normalized and annealed. The surface quality in Fig. 11 is shown to be poorest at the lowest speed, and best at the highest speed for all the cutting fluids. The surface quality at the highest speed of 461 fpm appears to be practically the same for all four conditions, namely, when cutting dry, with a 16 to 1 emulsion, with a sulphurized mineral oil, and with a sulphurized base oil.

All surfaces are very poor at the lowest speed of 94 fpm, and are intermediate for the intermediate speed of 283 fpm. Below the pictures of the surfaces, profilographs are shown for each of the three speeds. These profilographs represent the true contour of the machined surface at a magnification of 1,000 vertically, and 32 horizontally. They were made by drawing a diamond along the bottom of the cut between two feed marks in the direction of cut. They show conclusively that all surfaces are poorest at the lowest speed, are considerably improved at the intermediate speed, and are best at the highest speed.

The fact that all surfaces are very poor at the lowest speed, and that their characters as represented by the profilographs are different, would indicate that cutting fluids might be of greater importance in cutting at low speeds as in tapping, threading, broaching, etc., than they are at high cutting speeds. It is difficult to distinguish between the quality of the surfaces produced by the four cutting fluids at the highest cutting speed. It might be stated that the surface for dry cutting is best, and that for the sulphurized mineral oil is second best. That produced by the sulphurized base oil appears to be the poorest for the highest speed, but the best for the lowest speed.

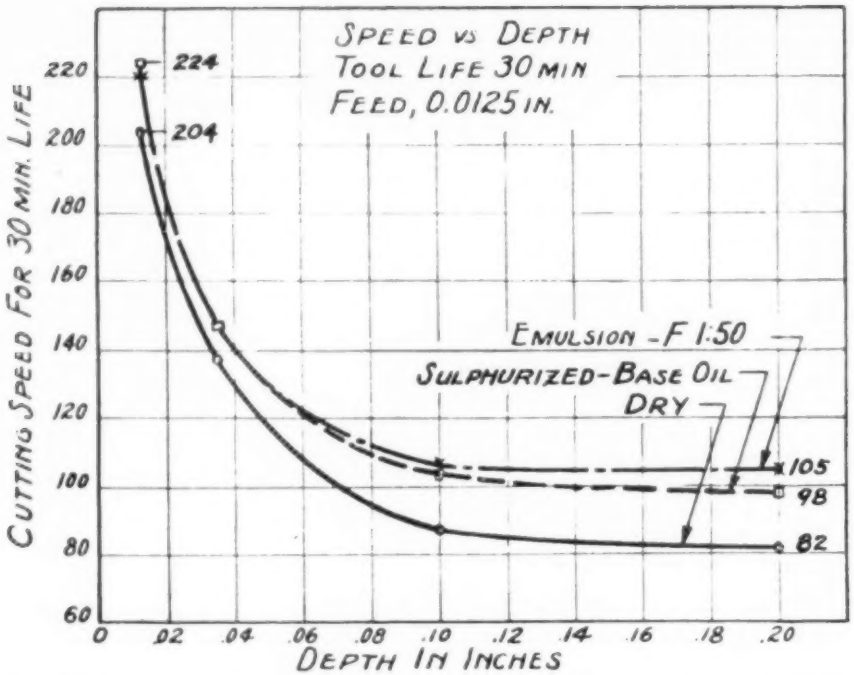


Fig. 12—Summary curves showing relation of V_{30} and depth of cut for a constant feed of 0.0125 in. for each of three cutting fluids when cutting SAE 2340 steel, annealed, with high-speed steel tools, of the form 8-22-6-6-6-15-3/64.

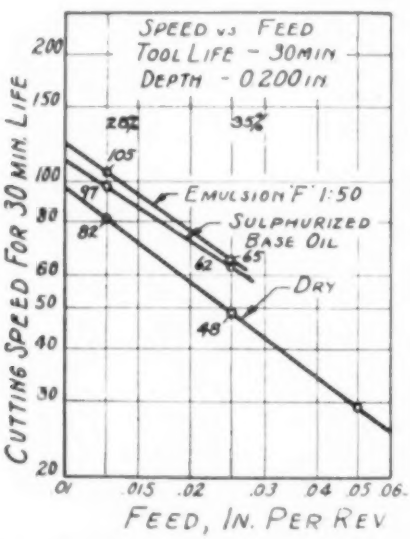


Fig. 13—Relation between V_{30} and feed for a constant depth of cut of 0.200 in. with same fluids, steel and tool as Fig. 12.

Tool Life vs. Cutting Fluids

It has been determined that V_{30}, that is, the cutting speed V for a 30-min. tool life, varies for a constant feed of 0.0125 in. and various depths of cut, as shown in Fig. 12. When the cut is 0.0125 in. feed and 0.0125 in. depth, the cutting speed for a 30-min. tool life, V_{30}, of the high-speed-steel tool is 204 fpm when cutting dry, and 224 fpm (10 per cent higher) when the tool is flooded by the emulsion or sulphurized base oil. When the depth of cut is increased to 0.200 in., the value of V_{30} is 82 fpm for dry cutting, 98 fpm (20 per cent higher than for dry cutting) for the sulphurized base oil, and 105 fpm (28 per cent higher than for dry cutting) for the emulsion.

The cutting fluids are most effective at larger values of depth. It is observed from Fig. 12 that if the depth of cut is increased further, there will be no reduction in V_{30}. Increased length of cutting edge takes care of the increase in depth in a direct relationship.

In the same manner, the value of V_{30} (the cutting speed in feet per minute for a tool life of 30 min. is shown to vary as straight lines on log-log paper in Fig. 13 as the feed is increased. When the feed is 0.0125 in., V_{30} is 82 fpm for dry cutting, 97 fpm for the sulphurized base oil, and 105 fpm for the emulsion. When the feed is 0.025 in., these values are 48, 62, and 65 fpm respectively.

Cutting-Speed Tool-Life Relationship

The formula expressing the relation between cutting speed and tool life between grindings for a given tool, material, feed, and depth of cut is $VT^n = C$, in which V is the cutting speed in feet per minute; T is the tool life or duration of cut between grindings in minutes; C is a constant depending on the conditions, and equals the cutting speed for a tool life of one minute; and n is the slope of the straight line on log-log paper.

If three or more turning tests were run on a metal in which all factors were kept constant except the cutting speed, V, a definite value of tool life at failure, T, would be obtained at each cutting speed, as indicated by points p, q, r, and s, on the lowest curve in Fig. 14. These and more points plotted on cartesian coordinates would indicate a parabolic curve. On log-log paper, they produce a straight line.

The equation of a straight line on cartesian coordinates is $y = mx + b$, but on log-log paper, it is $\log y = n \log x + \log b$ (or $\log V = n \log T + \log C$). The slope ($n$) of the line is negative and equals y/x; then $V = T^{-n} C$, or $VT^n = C$. (In Fig. 14, y as scaled should be divided by 2.67 as the vertical ordinate scale is 2.67 times the horizontal.) When $T = 1$, then $C = V$ (in feet per minute for a 1-min. tool life). Various cutting-speed tool-life lines ($VT^n = C$) are given in Fig. 14 for a constant depth of cut at three different feeds, with and without cutting fluids. This practice is now being formulated as an American standard.

Fig. 14 shows three solid straight lines which represent the cutting-speed tool-life relationship on log-log paper for dry cutting. The highest solid line is when the depth of cut is 0.200 in. and the feed 0.0125 in. The cutting speed for a 40-min. tool life is shown to be 79 fpm. If an emulsion is used, the long-dashed line above giving a value of cutting speed for a 40-min. tool life, V_{40}, is 99 fpm. This is 25 per cent higher than that for dry cutting. The short-dashed line was obtained when a sulphur base oil was used, and lies below the line for the emulsion, but above the line for dry cutting. It has a value of V_{40} of 93 fpm.

The intermediate solid line was obtained when the feed was 0.025 in., other factors remaining the same. The value of V_{40} is 46 fpm for dry cutting. When an emulsion is used, the value of V_{40} is 63 fpm, or 37 per cent higher. When the sulphur base oil is used the value of V_{40} is 61 fpm.

It was difficult to obtain the exact time of total failure of the tools when the feed was 0.050 in. because a preliminary tool failure often occurred early in the run, but the tool still would cut, becoming progressively

ler until the operator's judgment the time of total failure. The preinary failures introduced excesloads on the tools, causing them be broken off when using both the and emulsion.

Values of n, C, and V_{100} for each of the cutting-speed tool-life lines, as taken from Fig. 14 together with similar data from additional tests in this series, are shown tabulated in Table I. It is seen that the values of n and C will vary with the tool material, tool shape, size of cut, material cut, and cutting fluid. For the *constant area of cut*, tests 1 and 4 of Table 1, the relation between tool life and cutting speed was $VT^{0.133} = 111$ for the test cut 1 having a depth of cut of 0.050 in. and a feed of 0.025 in. and $VT^{0.147} = 143$ for the test cut 4 in. which the depth was 0.100 in. by 0.0125 in. feed

The cutting speed for a 1-min. tool life (C) is 111 fpm for the heavy feed, test 1, and 143 fpm or 29 per cent higher for the light feed, test 4. For a 100-min. tool life, the speed V_{100} was increased from 60 fpm in test 1 to 72.5 fpm in the fourth, or 21 per cent. The metal removed per tool grind at V_{100} is increased from 90 to 108.8 cu. in.

For a given *cross-sectional area of chip*, the greatest cutting speed for a specific life of tool is obtained when the ratio of depth of cut to traverse is large. The cutting speed falls off to a minimum when the ratio of depth to traverse is unity. For values below unity, the speed increases again.

With the *feed constant* at 0.0125 in., tests 2 to 5 of Table I, the cutting speed for a tool life of 100-min. varies from 176 to 71 fpm as the depth was multiplied such as 176 for *1d*, 120 for *3d*, 72-½ for *8d*, and 71 for *16d*. The metal removed per tool grind at V_{100} is increased from 33 to 213 cu. in. merely by increasing the depth.

With the *depth constant* at 0.200 in., tests 5 to 7, Table I, C is reduced to 1/2.5 of its value and V_{100} is reduced to 1/3.5 as the feed is quadrupled. The metal removed per tool grind increases only from 213 to 288 cu. in.

When *cutting fluids* are introduced, the cutting performance is improved as shown by tests 8 to 11 of Table I. In comparing test 5, dry cutting, with test 8 where an emulsion was used,

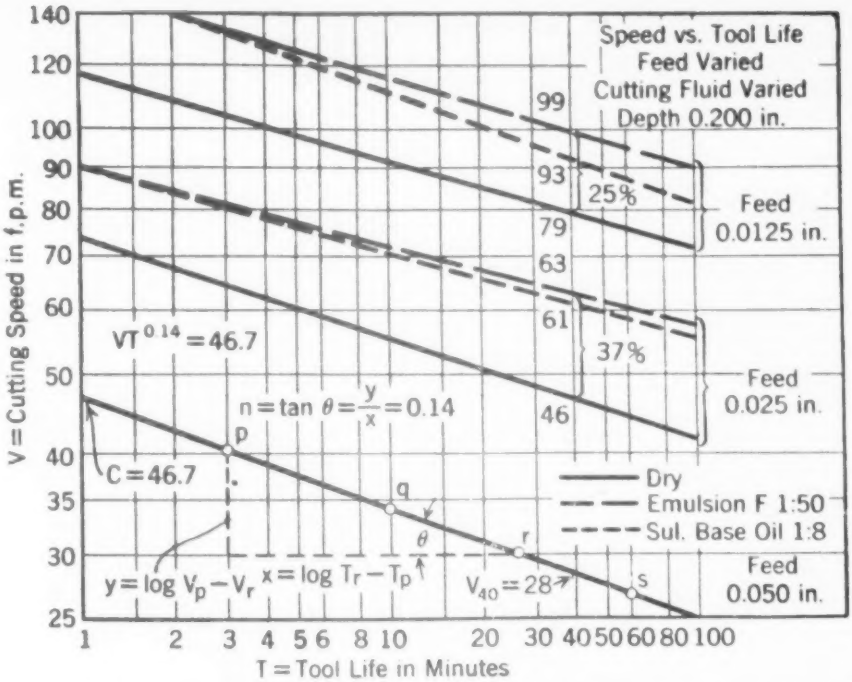


Fig. 14—Summary of experimental data showing relation between cutting speed and tool life when turning SAE 2340 annealed steel as the feed is varied for a constant depth of cut of 0.200 in. for each of three cutting fluids.

the value of C is increased from 117.5 to 150. The latter is 28 per cent higher. The cutting speed for a 100-min. tool life, V_{100}, is increased from 71 to 91.5 fpm for an increase of 29 per cent. The cubic inches per tool grind increases from 213 to 274.

By comparing the results of test 6, when cutting dry at a feed of 0.025 in., with test 9, having the same feed with an emulsion, the cubic inches per tool grind are increased from 246 to 345. The latter value is the highest listed in the table, and it is obtained with the greatest depth and feed. A value of 33 cu. in. per grind is obtained in test 2 when cutting dry with the lightest cut and lightest feed. By comparing the results of test 9 with those of test 11 for the same size of cut, it is seen that V_{100} and the cubic inches per grind are slightly higher with the emulsion than with the sulphurized base oil.

Table I—With values of n and C used in Fig. 14.

Test No.	Cutting Fluid	Depth of Cut, In.	Feed i.p.r.	n	Cutting Speed for 1 Min. Tool Life, C	100 Min. Tool Life	
						V_{100} cutting speed	Cu. in. per grind
1	Dry	0.050	0.025	0.133	111.0	60.0	90.0
2	Dry	0.0125	0.0125	0.125	313.0	176.0	33.0
3	Dry	0.035	0.0125	0.111	200.0	120.0	63.0
4	Dry	0.100	0.0125	0.147	143.0	72.5	108.8
5	Dry	0.200	0.0125	0.110	117.5	71.0	213.0
6	Dry	0.200	0.025	0.128	74.0	41.0	246.0
7	Dry	0.200	0.050	0.140	46.7	24.5	288.0
8	Em 1:50	0.200	0.0125	0.107	150.0	91.5	274.0
9	Em 1:50	0.200	0.025	0.097	90.0	57.5	345.0
10	SB 1:8	0.200	0.0125	0.132	152.0	82.5	247.5
11	SB 1:8	0.200	0.025	0.103	90.0	55.8	335.0

NOTE: The above data give $V_{60} = \frac{K}{f^{0.77} d^{0.37}}$

$K = 1.2$ for dry cutting

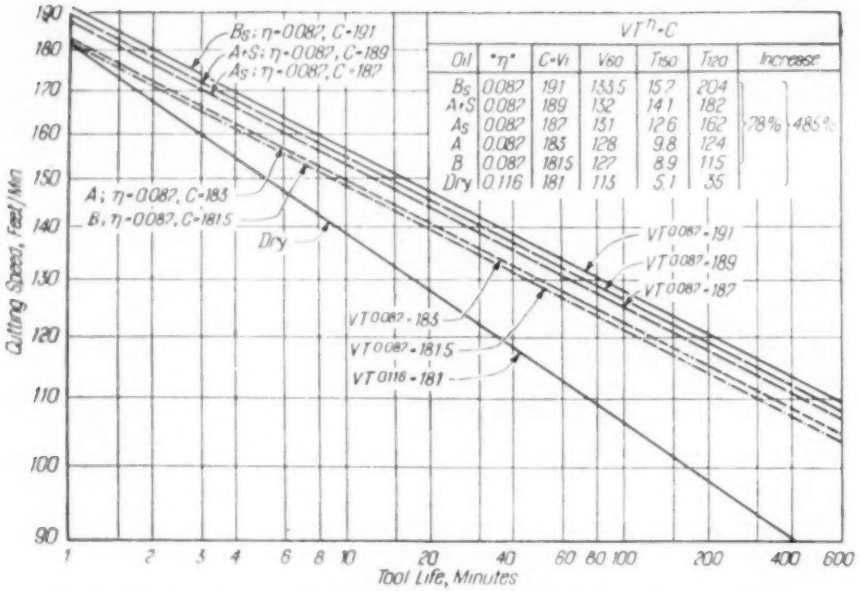


Fig. 15—Cutting-speed tool-life tests for five oils with and without added sulphur when turning annealed SAE 3140 steel.

Some typical results of cutting-speed tool-life tests when cutting dry and with five oils are summarized as straight lines on log-log paper in Fig. 15. Oils *A* and *B* were two base oils differing mainly in natural sulphur content. Oil *A* contained 0.1 per cent sulphur in its natural state, while oil *B* contained 2.03 per cent naturally occurring sulphur. Both oils had a viscosity of 110 Saybolt Universal seconds at 100 deg. F. Oils A_s and B_s were oils *A* and *B* respectively to which active sulphur was added by means of heat. These sulphurized oils contained active sulphur in the amounts of 0.75 per cent for A_s, and 0.70 per cent for B_s. Oil $A + s$ was prepared by simply adding 1.6 per cent of an oil soluble, synthetic, sulphur compound at 100 deg. F. and mixing thoroughly. The resultant oil had an active sulphur content of 0.90 per cent.

The tools used were of the 18-4-1 type of high-speed steel in the form of $\frac{3}{8}$-in.-sq. bits ground as indicated in the legend of Fig. 15. They were ground by using a 3846 J 5 BE Norton Company cup wheel on a special tool grinder. The setting angle of the tool was 90 deg., the depth of cut 0.100 in., and the feed was 0.0125 ipr. The tool life represents the time for complete breakdown. The oils were discharged onto the tool face at a rate of 4.5 gallons per minute through a $\frac{3}{4}$-in.-dia. pipe having a bore of 25/32 in. at the nozzle. This gave a velocity of 180 fpm. The oils were maintained at a uniform temperature of 105 deg. F. by means of electric coils. The highest line is for oil B_s which was the high natural sulphur base oil resulphurized. The oil *B* with only natural sulphur gives the lowest curve for the oils. The lines for the *A* oils are parallel to the *B* oil line, but are vertically displaced lower in the following order: $A + s$, A_s and *A*. Oil *A* with very low natural sulphur is slightly better than oil *B*. Oil *A* sulphurized as A_s is better than oil *A*. Oil $A + s$ is still better than A_s. The line for dry cutting is lowest of all and is at a greater slope. The values of *n*, *C*, V_{60}, T_{150}, and T_{120} are summarized in the figure. It may be pointed out that the best oil, B_s, gives a tool life for 120 fpm cutting speed 485 per cent better than that for dry cutting. The best oil, B_s, gives a value of T_{120}, 78 per cent higher than the poorest oil *B*.

Table II

In another series of tests in which various types of cutting fluids, including dry cutting, water, emulsions, and oils, were used, data were obtained as summarized in Table II. Each oil was tested with a heavy feed and light depth, namely 0.0255 in. by 0.050 in. respectively, and with a light feed and heavy depth, namely 0.0127 in. and 0.100 in. respectively. An annealed and normalized SAE 2345 steel was cut with a high-speed-steel tool as indicated in the legend

Table II—A summary of tool-life cutting-speed relation for various cutting fluids when turning an SAE 2345 steel, using tools of material "A" 18-4-1 high speed steel, shape 8-14-6-6-6-15-3/64.

Cutting fluid	Feed in in./rev.	Depth of cut in in.	Cutting-speed tool-life equation	Cutting speed for 20 minutes	Cutting speed for 2 hours
D	0.0255	0.050	$VT^{1/9.6} = 126$	92	78
W			$VT^{1/9.6} = 161$	118	99
Emul. B			$VT^{1/9.6} = 157$	115	96
Emul. B_1			$VT^{1/9.6} = 161$	118	99
Emul. C			$VT^{1/9.6} = 160$	117	98
M			$VT^{1/9.1} = 152$	109.5	91
S C1 M			$VT^{1/7} = 163$	105	82
D	0.0127	0.100	$VT^{1/7.3} = 168$	113	91
W			$VT^{1/7.3} = 219$	145	115
Emul. B			$VT^{1/7.3} = 208$	138	110
Emul. B_1			$VT^{1/7.3} = 211$	140	112
Emul. C			$VT^{1/7.3} = 207$	137	107
M			$VT^{1/7.8} = 192$	130	105
MO			$VT^{1/8.4} = 200$	141	116
S C1 M			$VT^{1/8.4} = 193$	136	113

of the table. The cutting fluids are indicated as follows:

D, dry cutting.

W, distilled water.

Emulsion *B* is soluble oil *B* plus 16 parts of water.

Emulsion B_1 is soluble oil *B* plus 8 parts of water.

Emulsion *C* is soluble oil *C* plus 16 parts of water.

M is a light mineral oil, viscosity 110 at 100 deg. F.

MO is mineral oil *M* plus 5 per cent oleic acid.

SC1M is a commercial sulphur chlorinated mineral oil.

This table gives the equation $VT^n = C$ for each of the oils, and values of V_{20} and V_{120}. It is seen that dry cutting for both sizes of cut gives the lowest cutting speed, whereas water gives the highest cutting speed. The sulphur chlorinated mineral oils are next to the lowest for the shallow cuts. The *M* oil is next lowest, and the emulsions are equal to or slightly lower than the results for water. For the deep cuts with light feed, dry cutting is the lowest, the water is the highest, the emulsions just under the water, the *SC1M* just below the emulsions, and the plain mineral oil the lowest for the liquids. It is further to be noted that the cutting speeds V_{20} and V_{120} are all relatively higher for the deep thin cuts than for the shallow thick cuts.

Figure 16

The relationship between net power developed by the motor and various types of cutting oils are shown in Fig. 16. The power is plotted (for a cutting speed of 120 fpm) over each oil as is the time for preliminary failure and total tool failure. In these tests, a normalized and annealed SAE 3140 steel was cut with high-speed-steel tools of a shape 8-14-6-6-6-15-3/64, when the depth of cut was 0.100 in. and the feed 0.0125 ipr. The oils were tested at 110 deg. F., and they were applied vertically downward (at a rate of 4.75 gallons per minute from a 25/32-in.-dia. nozzle) on to the tool face over which the chip was sliding. It is seen that for dry cutting, the preliminary tool failure for 120 fpm occurs at about 7 min. The total failure is at about 12 min.

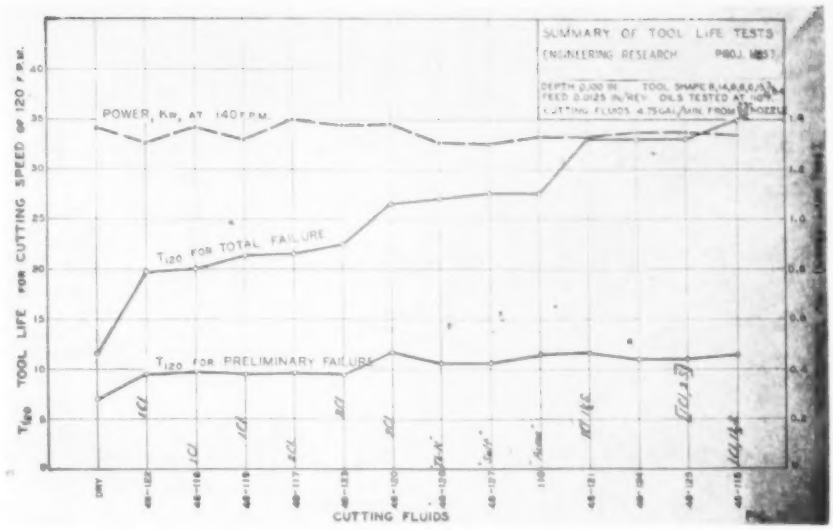


Fig. 16—Net power in kilowatts developed by motor and time in minutes for preliminary and total tool failure when turning a normalized and annealed SAE 3140 steel. The cut was 0.100 in. deep and 0.0125 in. feed, and the tool was of high-speed steel ground to a shape of 8-14-6-6-6-15-3/64.

The power obtained on a wattmeter by subtracting the tare, that is the power developed by the machine running idly, from the gross or total power is shown to be about 1.36 kw. when the speed was 140 fpm. When the first group of three oils was used, each having a different type of base oil but to each of which was added 1 per cent of chlorine, the preliminary tool failure increased to about 10 min., the final failure to about 20 min., while the power was about equal to that for dry cutting for one oil, but slightly lower for the other two.

For the second set of three oils containing 2 per cent chlorine in the same three base oils instead of 1 per cent, the preliminary failure remained about the same for two oils, but increased to 12 min. for one of the oils. The total failure increased to about 27 min. The net power however remained practically the same at 1.27 kw., and somewhat higher for dry cutting. This shows one specific illustration for which the power required in cutting with oils is greater than that required for dry cutting under the same conditions. The tool life, however, is considerably increased by the use of the oil.

Values of preliminary failure for three commercial sulphurized oils indicated as 126, 127, and 110 are shown to be about 11 min.; the total tool life about 27 min. The cutting speed for the same tool life for these three oils averages 11 per cent higher than that for dry cutting. This corresponds to an increase in tool life for the oils over dry cutting of 237 per cent. The power 1.25 kw. is the lowest value of all the oils.

Oils 121, 124, and 118 contain 1½ per cent sulphur in addition to the 1 per cent chlorine for each of the three base oils. The preliminary failure is about the same as that for all the other oils. The time of total failure, however, is greatly increased to about 33 min. The time of total failure for oil 125 containing 1 per cent chlorine and 3 per cent sulphur is equal to that of the other oils containing only 1½ per cent sulphur. The power, however, remains practically the same for all of these oils.

The selection, application and care of cutting fluids are very important factors in maintaining high production and low cost in the processing of metals. From his lecture, Professor Boston has summarized thirteen conclusions and recommendations concerning these factors. They can be found on page 102.

Problems of the Service

influencing design, procurement and production—

"We have got to buy back yesterday, and the way to do that is by the exercise of American ingenuity."

Brigadier General Kenneth B. Wolf

Brigadier General Kenneth B. Wolf is Chief of the Production Engineering Section, Materiel Division, Air Corps. Started as a flying cadet in the first war, without benefit of West Point, he came up, as some might say, by the hard way. He is a graduate of the Air Corps Tactical School, the Air Corps Command and the General Staff School. He was commissioned as Brigadier General on March 1, 1942.

THERE has been considerable talk about the reorganization of the Army—so-called streamlining—that was brought about by mechanization. Let's see how the Air Force operates under this modern set-up.

First, it is broken up into Commands. There is the Training Command, whose function is the training of flying personnel. The Technical Command trains mechanics and ground personnel. The Air Service Command maintains the airplane and handles the spare parts and supplies. Then, there is what is known as the Materiel Command led by Major General O. P. Eckles, because of whose persistent effort and the carrying with him of an ideal, we now have the famous Flying Fortresses, and the Liberator or B-24. His office is in Washington, and he has a technical staff at that point.

Part of the Materiel Division is known as the Production Division which is my job.

Throughout the United States are districts through which we decentralize the activities of the Materiel Division, which have to do with procurement of equipment and supervision of the job in the field.

"American mechanics, working in the jungle, had taken wrecks and put them together to make three airplanes. It was hot. There was little equipment. But they managed to get three airplanes in the air for this attack and back on the ground.

"The credit belongs to the daring pilot and that miracle worker, that hard-working, sweating, cursing air force mechanic. But, to a great degree this success was made possible by American Tool Engineers, and their ability to make interchangeable parts."

As for the war itself, there is little I know other than what is in the papers, in magazines, or broadcasts by radio commentators. By the first of March the Japanese were sure that General MacArthur's Army, which was boxed in at that time in the Bataan Peninsula, had no more fighting airplanes. So, they felt free to engage in various activities without worrying about their air observation or air attack. However, they had over-

[illegible] one thing—that was the ingenuity of Americans and American equipment.

[illegible] three Japanese ships steamed [illegible] Subak Bay and began the business of unloading troops and materials. Suddenly three American B-40 pursuit planes came out of nowhere and attacked. Some 30,000 troops and [illegible],000 tons of shipping were destroyed. How did it happen? Well, American mechanics, working in the jungle, had taken wrecks and put them together to make three airplanes. It was hot. There was little equipment. But they managed to get three airplanes in the air for this attack and back on the ground.

The credit belongs to the daring pilot and that miracle worker, that hard-working, sweating, cursing air force mechanic. But, to a great degree this success was made possible by American Tool Engineers, and their ability to make interchangeable parts.

You can see from that example how vital interchangeability is to the armed forces. You must be able to make something out of nothing under war conditions. That is the job that we are striving for in the Air Force, and that is a job in which Tool Engineers can assist us.

Another problem on which they can help concerns supplies. To give a combat commander an air force to start an offensive, you must supply him with a continuous stream of replacement parts. It is the Tool Engineers job to find a way to keep this tremendous flow going.

When visiting a plant, Lt. General Knudsen has one particular subject that he always brings up, no matter how small or how large the factories or how good a job the Command is doing. He compliments them on what they are doing, but he always requests that they do more and do it faster. He tries to leave that thought everywhere he goes.

We have got to buy back yesterday and the way to do that is by the exercise of American ingenuity.

Men in the production game know what a pleasure it is to have a beautiful plant, specially designed, specially equipped, to do a tremendous job. That is necessary and we are getting those plants. But we are not getting them fast enough, and, therefore, we are forced to take the tools and the personnel that are available and get from them the most that is possible now.

Recently, I inspected an aircraft factory at Wichita, Kansas, unique in that it is producing modern all-metal airplanes in one half and building wooden airplanes in the other.

That in itself is quite an achievement but the outstanding thing to me, in going through this plant with the Chief Engineer and the Chief of Production was their pride in a new press specially designed. They were proud of the way they had obtained this piece of equipment. Originally through the operation of priorities they were not to get the press for eight months.

The Chief Engineer called a huddle with his production people and said, "We must have a press!" They built it in three weeks' time! That plant will be far ahead of schedule due to that one thing.

In going through the National Cash Register Company in Dayton recently, General Knudsen saw old machine tools recalled for a job in this war which had been installed during the last war.

Two types of conversion are involved in plane construction — machinery, of which some mention has been made, and the conversion of materials. Using up aluminum just as fast as it can be supplied, we still need more. Meanwhile we are substituting wherever possible with non-strategic and non-critical materials.

Little bits of all types of craftsmanship are required in building an airplane. A good example is the case of the Flying Fortress. It is a product of several hundred different manufacturers. Over forty percent of the airplane is built in the East and the Middle West. This airplane is also built completely by two other manufacturers, who in normal peacetime were rivals. That is a definition of cooperative effort.

Only through design of tooling, gauges and other inspection equipment is it possible to do this job. Several innovations have been brought into use within the last year, which are cutting down time and speeding up the job.

Starting from scratch, plane production begins with the lofting process. This process, long used by the shipbuilding industry, is comparatively simple. The Engineering Department draws a small sketch of the

Aircraft Standardization

Immediately after General Wolf completed his talk on "Problems of the Service influencing design, procurement and production," a question was asked which has entered the mind of practically every Tool Engineer. Because of its vital import, both the question and General Wolf's answer are given here.

The General was asked, "To what degree do you think the aircraft industry will ever be able to standardize models, increasing the possibility of interchangeability of parts?"

He answered, "That is a very good question. I am glad you asked it. I noticed on the magazine rack this morning a periodical with this headline across the cover, 'The Air Force Must Freeze Models.' But, I would hate to be sitting in a poker game with an inside straight, wide open, and be told that from there on out that was the hand I was going to have all the time.

"What we are trying to do in this business is to have the winning hand. The way to have the winning hand is to have the best equipment. (About some equipment I can say that we have the best high-altitude and the best low altitude pursuit plane in the world. We have the only long range, heavy bombing airplane in the world. But, we don't have them fast enough.)

"That's why we cannot freeze. The planes that we are building today, were designed two years ago to fit particular tactical problems. We didn't know we were going to supply these airplanes to various allied nations who have their own operation requirements. We didn't know, at that time, that we were going to fight this war all over the world.

"Suppose the flying fortresses were being used by the boys shooting down the Japs, in Java and the Philippines and they need and find certain items that will increase their tactical usability. Now, wouldn't we be in a fine situation if the boys that were fighting with these airplanes cabled back here: 'If you only put some more gasoline in this airplane, we can go another thousand miles, or if you can change this bomb rack we can carry another thousand pounds of bombs.'

"If that were frozen, we would be sitting there with an inside straight, wide open. It is impossible to freeze. We freeze the basic design. The aircraft industry will tell you that, from the standpoint of man hours, if basic design is frozen, the operational changes in comparison do not amount to a great deal.

"That, basically, is the reason we cannot freeze design."

new plane, including the plane dimensions. This sketch is passed along to the lofting department, where engineers draw a full-sized outline of the plane on what is known as the lofting floor. This is the final basic reference drawing. It is the standard then from which all future dimensions are derived.

Next to come are detailed drawings showing bulkheads, beams, and other structural members. This composite view of the airplane, called the body plan, is drawn full-sized in plywood. Dimensions for the body plan are taken from the standard on the drafting floor. Next, drawings, templates, patterns and tools are made up from measurements taken directly from the body plan.

The result of using this system is a tremendous decrease in the amount of jigs and fixtures required. The airplane becomes to a great extent, a vast assembly job.

We have minimum requirements on interchangeability, which we feel that we can get at this time, but we are striving to get to the point where we can effect approximately seventy-five percent interchangeability. Outside the actual operational need for it, the other requirement is a corollary to the fact that the Flying Fortress for example is built in three different factories. Replacement parts shipped out for service may be required in a plane with a fuselage built by "A" and a replacement wing built by "B".

Manufacture of *Aircraft Engines*

H. E. Linsley, Wright Aeronautical Corp.
Paterson, N. J.

". . . a historical record of the opening words of our reply to Hitler."

H. E. Linsley exhibited two motion pictures. The first showed production methods in use a year and a half ago, "when to most of us, the war was a European disturbance, some 3,000 miles away, and many . . . thought it could not happen here." The second film showed some of the production methods, new to the aircraft industry, now used in Wright plants and sub-contractors' plants. Following are excerpts from Mr. Linsley's comments.

OUR PRESIDENT has asked us for 60,000 airplanes. For today's aircraft we must produce approximately two and a half engines for each airplane—about 150,000 engines! I want to show you two motion pictures about building them. I would like you to think of them as a historical record of the opening words of our reply to Hitler.

The first, filmed about a year and a half ago, shows the methods in use then. Those who dealt with production at that time fortunately realized that ahead lay schedules of an immensity never even dreamed of. It was an opportunity to try out production methods never seen in aircraft engine industries—methods used by the automobile industry.

The second film, shows how some of those high production methods have been used in our own new plants, and in the plants of some of our subcontractors.

Credit must go to the designers and builders of the supermachine tools, who have thrown themselves wholeheartedly into the tremendous problems.

In the last two years we have expanded from one to five plants. We have increased employment more than four times. We have increased engine output more than six times.

The biggest development has been the erection of our huge new factory, devoted entirely to production of the 14-cylinder, 1700 H.P. Wright Cyclone.

Within the walls of the machine shop it would be possible for six major baseball games and four college football games to be played simultaneously, and you would still have plenty of room for 35,000 spectators at each of those ten games.

But what really matters is that we are able to produce more horse power per square foot than ever before. That has been achieved through application of special purpose machine tools, wherever such tools could do the job.

We found in most cases that special tools cost less than the equivalent number of standard tools which they replaced. In a few cases where they cost more, the difference was absorbed in a few weeks by the reduction in machining time. Even more important was the fact that we were able to use a large number of semi-skilled workers. The comparatively small number of available trained men could be better employed as supervisors, or as the highly important set-up men.

Another advantage has been that through the use of special equipment we've taken a tremendous load off the overburdened shoulders of standard machine tool builders. Witness that a group of twenty-two special machines are giving a work output which would normally require 154 standard machines.

The Man Behind the Man

Behind the Gun—

Excerpts from the Address by Dr. Charles Copeland Smith

"Let's take the facts."

IT is the fashion now-a-days to say that this world is divided only between two ideologies. If that were true, it would be very unfortunate. There is the old ideology of the man who used to say, and sometimes still foolishly says, "I am the owner of my own business; I am going to run my own show in my own way; I am going to keep the key of my own plant in my own pocket." It is the old ideology of the rugged individualist, and is as dead as mutton.

And, then, there is that other ideology known as totalitarianism, the opposite of all that.

We are told that those are humanity's only choices. I am certain there is another. I mean the ideology of what I would call cooperative individualism, the instinct of men with like ideals and similar interests to get together in such societies as this.

There is no question that cannot be answered in this atmosphere; there is no problem that cannot be solved in the spirit of association.

* * *

THREE Americans of unimpeachable integrity and Americanism tried to speak to the American people regarding the significance and the seriousness of the war in which we are at present engaged.

The first of them was Mr. Associate Justice Roberts of the Supreme Court, the Chairman of the Pearl Harbor Commission. He said that the tragedy of Pearl Harbor was due not only to the complacency of Admiral Kimmel and of General Short, it was due to the continued complacency of all of us!

Three days after that Mr. William K. Batt, who was Number 2 man in O.P.M., and is president of the illustrious SKF Industries said, "At last we Americans are embarked upon a war which we might not win!"

And then, two days after that, Admiral Stanley, also a member of the Pearl Harbor Commission, reiterated that it was unfortunate for America that the war experiences hitherto had served as a very bad apprenticeship for the sort of war in which, at last, we were engaged.

There is not likely to be any very strong applause, at the hearing of such statements as those, but you have got to hear them! We are face to face with something we have got to meet with every resource, and all the courage and all the spirit of sacrifice that we, as individuals and as a nation can demand.

There was a man in Galilee, nineteen hundred years ago, who said to pretty well every audience he addressed, "Take heed how ye hear!" It seems to me that these days we need someone to go in and out among us saying "Take heed how ye read!"

I am certain that the press of America, under tremendous difficulties and handicaps of which we laymen know very little, is endeavoring as best it may to bring the truth of the world situation home to us, to make us realize how ominous is the situation. And, yet, somehow such is our congenital optimism that we only pick out from what we read the bright spots, and fasten our minds and our emotions upon them.

Let's take the facts!

We are in for a long haul. There is needed not merely a strong, but an enduring pull.

Mayor George Fielding Elliott said three weeks ago, there was not one single German Division so badly damaged or so utterly smashed that it couldn't be reshaped, resharpened for the spring offensive that Europe, tonight, dreads more than it dreads death itself!

This time Hitler will make his deadly route this one objective, those Caucasian oil fields. And if he secures their oil reserves, well, then, ten years, thirty years, who knows? He will be knocking at the western gates of India just as tonight Japan is within those gates.

And, as for the Pacific situation, why in the last fifteen days Japan has advanced her battlefront fifteen hundred miles. That battlefront, tonight, reaches as far as from the New Jefferson Hotel in St. Louis, Missouri, all the way to Liverpool, England, 4300 miles and then some!

That's the sort of situation that we, all of us not the men in the front line merely, are in.

* * *

WE have made a stab of getting ready to face war for nearly two years. Why is it that this day of preparation is so interminably long?

One reason is that we have affiliations with the ends of the earth. And for us to be militaristic, would be for us to deny ourselves. That has been our problem, from one end of Amer-

ica to another. And for us to be able to conceive of anything other than that proved to be a psychological impossibility. That was the greatest psychological problem that history has ever contained.

* * *

THEN, of course, there has been another reason which you know more about than I do, far more about it! I mean the problem of swinging over from radio cabinets and refrigerators and automobiles to something diametrically opposite. This achievement has been one of the miracles of industrial history and you know that!

Then, of course, there has been another reason. I don't know whether I should mention it. We are all united now. But in the first six months of 1941 we lost six million man days through strikes . . . Three and a half million of them in our specifically defense industry. Three and a half million man days of lost labor mean 220,000 machine guns.

We lost eighteen million man days of labor in the second six months of 1941. But, Pearl Harbor came to us! I sometimes wonder whether it was an unmixed disaster. I believe it did at last shake this nation out of its sleep. I believe that from that day we did at least begin to understand.

* * *

LET me tell you how we have been going places. You are Tool Engineers, the cream of the nation, the very nucleus of the nation from this viewpoint. Listen to your own story.

Until two years ago our total annual production of machine tools seldom exceeded thirty millions of dollars. In 1940, seven months of which were devoted to what we all called then the Defense Program, we raised our total annual production of machine tools from thirty million dollars to fifty million dollars. Last year, under the continued impetus of the defense effort, we raised our machine tool output to the magnificent total of two hundred million dollars. Then came Pearl Harbor, and now—I have the figures for January and February, 1942—what do you think they are? Our machine tool output has already reached a total that annually will represent not millions of dollars but billions of dollars.

And, that bottleneck is broken, the greatest mechanical bottleneck of all. And, I am certain the men in this room and the 10,000 others that they represent throughout America are to be heartily congratulated upon that magnificent story.

How many medium sized and heavy tanks to do you think we were making in these United States, two years ago today? Well, we weren't making one a month as it was something less than twelve per annum. What do you think the story has been since Pearl Harbor? In February, 1942, the shortest month of the year, American Industry manufactured no fewer than 2800 medium tanks.

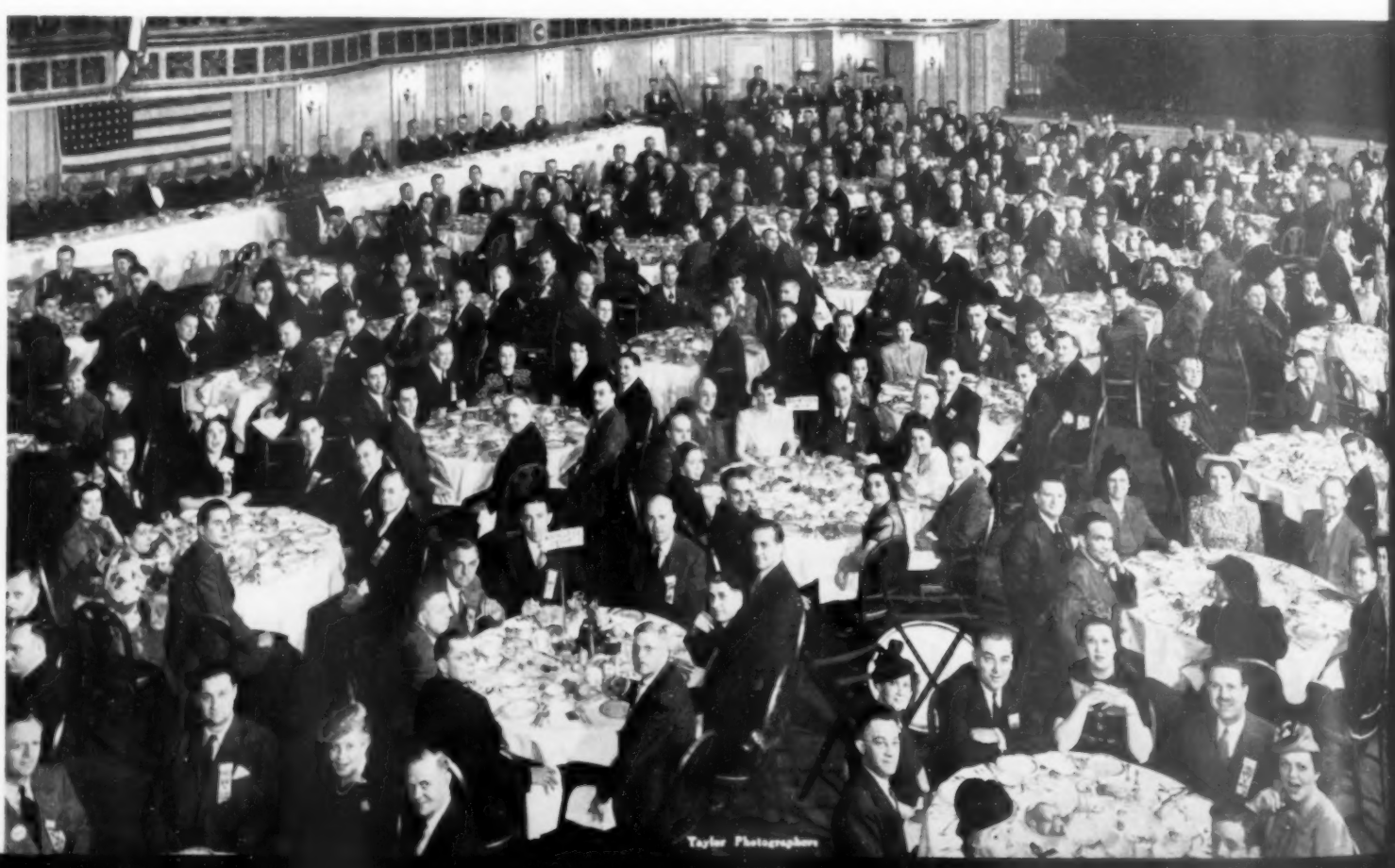
What about airplanes? Four years ago today, throughout America, in every type of plane, we were producing rather under than over 250 planes per month. Today, well, Donald Nelson told the story just last week, that in the shortest month of the year, two months after Pearl Harbor, American Industry produced more than 3,000 combat planes alone.

* * *

WE are fighting for all that civilization is; we are fighting for all that civilization means. It may be a long fight, and to us, also, may yet come the guerdon of blood and sweat and toil and tears. And yet, sometimes I think God Almighty pays a generation its greatest compliment when he lays upon it his greatest burden.

I like to think there will come a day when, whatever the cost, in blood and sweat and toil and tears, you and I and all our land will say, "Well, never mind what it cost. If decency be reestablished, and if freedom and religion be re-enthroned, never mind what it cost. It was worth it."

A.S.T.E. Annual Dinner Meeting



TOOL ENGINEERING
ASTE
KEY TO VICTORY

Here are some practical answers to questions Tool Engineers asked at the A.S.T.E. St. Louis convention

What Tool Engineers Asked

and what they were told

Cutting Tool Design

Is it advisable to re-nitride high speed steel tools after resharpening?

A reamer nitrided gives at least twice as many holes per grind as not nitrided, regardless of what you use it on. But you should cylindrically grind, or O.D. grind them after nitriding due to the fact in nitriding you get a little growth sometimes a couple of tenths, which makes the reamer oversized. Also, you get a little warping at times, so we do grind them after nitriding. However, when a manufacturer uses a reamer he, of course, grinds them on the O.D. He doesn't flute grind them and in that case it is not necessary to renitride them. Where you want the nitrided surface is in the flutes, to take care of chip disposal and back up the cutting axle. If you do regrind the flutes, re-nitriding might be necessary, though it may build up a brittleness there that is not desirable.

However, if you regrind the tool by grinding both the diameter, the O.D. and the face, then, of course, you want to renitride. But, if you only grind one surface, it is better not to renitride.

• • •

To what extent are diamond wheels used today for making the edges of tools in production work?

Diamond wheels are extensively used today in carbide grinding. Some of the carbide manufacturers recommend crystalline wheels for rough grinding, using a good flood of water and then the diamond wheel for finish grinding, using a little kerosene, jet arrangement. You can get 100, 200 and 300 grain diamond wheels. It does not seem that diamond wheels are being used to any extent today on anything but carbide. However, some manufacturers, do regrind high speed tools with a diamond tool, claiming better finish and longer life for the tool than they get with an ordinary abrasive wheel. Others have found in using the diamond wheel that anything softer than 68 Rockwell C will rob the wheel of its diamond very rapidly. If you impart the diamond to thick grinding you actually tend to cut on diamonds rather than on the material you started out with.

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What progress is being made with carbide milling cutters?

They are coming quite rapidly. Some remarkable tests have been run. Carbide is coming and coming fast. Titanium tungsten carbide has been developed for steel jobs. When the war is over we will have time to learn more about how to tip these tools, how to grind them, what finishes can be obtained and types of carbide to use.

Mr. Judkins of The Ford Sterling Company told the Southern Connecticut Tool Engineers' Chapter a couple of weeks ago, "I think the last three or four years have done away with high speed steel in Germany and they have gone to carbide."

The Deputy Machine Controller of Canada has said that rapid strides are being made in Toronto, Ontario, using carbide tip tools. The war program is bringing that to the front. After the war is over you will see a much greater use, and properly so, of carbide tipped tools.

A California machine works claims that more milling

with carbide is being done on the Coast than any place else in the country, particularly on alloy steel. They mill 210,000 P.S.I. chrome-moly, 48 Rockwell C, better than 157 surface feet, with straight milling cutters and face mills, continuously on production.

On some jobs, they end mill two fluted ends, three-quarter inches in diameter, and run them 2,000 r.p.m. They run turn table jobs as fast as they can operate the turntable.

They have found in all machining with carbides, on steel, that machining work dry gets a better result, unless there is a lot of flow of material. Soluble oil is the best medium there.

They claim that running a job with soluble oil brings the piece off the machine quite hot. Running it with straight cutting oil makes the piece too hot to hold. Run it dry and there is no warmth in the piece at all; it is all in the chips.

The number of pieces lost between grinds doesn't account for any difference in cost materially, because the gain is so great on the handling of the work. It is a much greater pleasure for the operator to work. The piece comes off cooler, running dry. Chip disposal is nothing —small chips, extremely hot when they come off.

They get little tip breakage because when the piece starts getting hot, the operator cannot handle it with his hands—which isn't very hot—they take the tools off for regrinding.

They also claim to mill anything that can be milled. They run jobs with tungsten carbides, running 21,000 r.p.m. 27 feed, removing 240 cubic inches of metal per minute. It is all in tool design.

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Salvage

Many machine operators say they get more pieces from a cutter after it has been salvaged than they did when the cutter was new. What is the reason for this?

There have been strange experiences along that line. First salvage companies do not claim to accomplish that except in the cases where they have an opportunity to change the rake, the clearance or other details of design, to suit a specific application.

The superintendent of a plant in Milwaukee found that saws used for slitting aluminum piston skirts were used on 400 pistons before salvage. After salvaging, they delivered 1200 to 1300 jobs.

On that particular job the saw teeth, to begin with, weren't suitable for the operation. Salvage resulted in giving the proper rake for aluminum. It also gave a tooth that was ground all over, whereas on the saws as bought, where the teeth were stamped out, they had been given only a sharpening grind on top. Salvage made the tool more applicable to that particular operation.

To what extent has the salvage industry contacted hard chrome plating to build up the edges of reamers that are slightly undersize? The gauging department of an eastern machine tool manufacturer tried to build a chrome on the face of the tooth of a 5 inch shell reamer. It was virtually impossible to get a deposit of chrome on the cutting edge.

In order to grind the heel down to get a cutting edge, you will have taken off the chrome and lost your size again. But, if on the thousandths time you do get a deposit on there, the first time you put it to work it will flake off.

Probably a thousand important industries in this country, at one time or another, have tried to build up reamers by chrome plating, without a successful accomplishment. There was a time, years back, when they used to heat up reamers and swedge out the teeth so as to restore the size and grind them back. That was very bad practice, and abandoned long ago, because it involved heat treating of steel of which nothing was known by the tool salvage industry.

Most shops use a range of sizes, and even if chrome plating was successful, it would still be more costly than to resize them without it. If you have got one inch reamers that are below your useful limits, you probably use 31/32nds, or 15/16ths. You have a better job if you will bring your reamer to that size and forget the plating.

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Aircraft Design

Concerning the scarcity of aluminum alloys. Some few years ago most of our airplane parts which are made of aluminum alloy, were made of ST17, with a tensile strength of 55,000 pounds per square inch. During the past few years the airplane manufacturer, and engineers, have changed this specification to ST24 with a tensile strength of 62,000 pounds per square inch, a difference of 7,000 pounds. Now, there are some available stores of ST17. I would like to ask if it would be advisable to make parts from the ST17 instead of sending it back to the foundries and making it over into the ST24?

We are engaged in that very problem right now, of going back to 17ST wherever possible. Of course, we cannot feed these changes in very fast without causing a delay in production. I spoke here a moment ago about conversion. We are converting as many of our requirements as possible in order to conserve materials and to use up non-critical materials. And, this problem which you mentioned is being placed into effect as fast as we can. Of necessity we must leave that up to the designer and particular manufacturer to feed that change in.

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Answers

Isn't there a need for two new types of planes —a lighter pulling type, and a new type pursuit plane?

We have certain basic types of planes that we must have to carry on the offensive. It has been our effort, up to this period here, to get the basic types which are pursuit and bombardment. But in the master plan we have other types. Some are just now going into production. Some will go in shortly.

In the battle of Crete, the Germans used a great number of gliders. That is strictly a German development, primarily brought about during a period when Germany was disarmed. They resorted to the glider as the means of building up an air force, became expert in their use and during that experience determined that it was possible to tow behind an airplane a large glider which could carry up to twenty-five men, or equivalent materials.

We, too, have studied this problem and are engaged in obtaining that type of equipment. As the war goes on, we will find other needs. We are engaged upon a tremendous program for transport airplanes.

We must cross the two largest oceans of the world. We must haul a tremendous quantity of supplies to back up the fighting forces. We believe we can do this to a great extent by air. We know we must do it. Therefore, in the master plan we have both these airplanes that are mentioned.

We have the designers carry on their boards improved types in order to maintain the best poker hand. So, as fast as possible, and when required, we will of necessity have to change types and introduce other types and make obsolescent some of the types we are now using.

As you know, in the last war we had tremendous use from single engine, two place observation type plane. This airplane was used for reconnaissance flights and for the observation of artillery fire. That particular type of airplane cannot survive in this type of aerial warfare. We now require high speed, high altitude airplane to get information on the enemy and its dispositions.

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Is there any set system used regarding relationship between a subcontractor or main contractor, or is that arranged between prime and subcontractor?

The airplane itself, which is primarily the air frame, as we call the body, is usually built by the prime contractor or under his direct control. The various other items in our business we call government furnished equipment. Those items are purchased direct by the government. Delivery requirements are handled in two ways. First, we may call upon a manufacturer "A" to increase his delivery schedule beyond the capacity of his own facilities. We suggest to him, then, that he arrange a family of subcontractors. That is a contractual arrangement between the prime contractor and the subcontractor.

Second, the air corps itself may select an organization, bring them in, and draw the prime contract direct, calling the two parties together for their own contractual relations and requirements, such as patents, etc.

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A very serious and delicate subject concerns inspection tolerance limits. One authority when asked about them merely stated that when you are in the air you cannot get out and walk. But there are parts which absolutely do not need to be built to the tolerance limits that they have to be held to today. Relief from this would be a big help for increased production. Why can't these limits be relaxed?

That is an age-long question. For years it has wound up many conferences, which indicates that it is a progressive condition.

During the peacetime era it was necessary for the Air Corps to make the equipment last as long as possible. Specifications were based on a predicted life of the airplane.

Three years ago, when we started on this program, one of the first things we attempted to do was open up on our inspection requirements. We intend to do it, and are doing it, but as with many other things it depends upon the human element.

Inspectors in the field authority have been given considerable leeway to accomplish the opening up of production requirements, but that depends to a great extent on the individual. Frankly, the question goes right back to the Tool Engineers. We crave suggestions from industry as to how we can speed this thing up. We are not hidebound about this.

As you know, the Air Force, itself has been expanded in a tremendous way. We do not have a great number of experienced people. We have had to spread experienced people out very thin. But, we ask your cooperation in accomplishing this one particular thing. That is how can we speed this thing up?

We would like to have brought to our attention your views on this matter and your suggestions. We have a very precise item of equipment on which life depends, and as we said last year, you cannot get out and walk, but on the other hand the wartime requirements are ,from the standpoint of life and the equipment, much less than in normal peacetime expectancy. Therefore, we would like to take as many shortcuts as possible without endangering life and upsetting the mission for which the airplane was built. We must make a long range bomber which can go to the objective and get back. If we can assure ourselves we are doing that we want to take the necessary shortcuts.

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What is the relative importance of the speed with which engineering changes must be accomplished? Is there a classification of the different types of changes which Tool Engineers are asked to make?

The matter of changes falls within three categories. In the first category is a safety change, where it is determined by test that a change must be made in order to maintain safety of equipment and personnel. That takes first priorities and it is mandatory that we stop production and get that change into effect.

The second change is an operation change. That is the change I spoke of a moment ago where after the airplane has been submitted to combat we find a certain change will improve the combat effectiveness of the airplane.

The third change, and last priority, is a change which will give us increased performance. That is, it will make a superior workman out of the airplane and that of necessity must take the last place if the airplane itself can maintain its combat relation with the enemy airplane.

A good example of that is during the battle of England, the British attempted to use up their Hurricanes first until they arrived at a point where they could not outcombat the Messerschmit. Then they introduced the Spitfire.

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Concerning shortcuts, I would like to know to what Division should a manufacturer who can produce more in less time offer his methods for the dissemination of that knowledge to the industry?

For the aircraft industry, if you have that information, address it to the Assistant Chief of the Materiel Command, Wright Field, Dayton, Ohio. It is then our responsibility to analyze this and present it to the industry.

If it is a matter involving engineering, the Project Officer, we will say on the Flying Fortress, is responsible for the engineering of this airplane. He will call a conference of the engineers building the Flying Fortress and will discuss the availability, and the practicability of doing this job. If it is a production method, it should be brought to the attention of the Air Corps Inspector or Air Corps representative in that particular factory, or area.

If you do not have an Air Corps representative or a Naval representative in your plant or city, you can write to the District Supervisor of that area.

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In '33 and '34 when the German Government was going into their big expansion program, they produced considerable numbers of Messerschmit and Junkers. When they let any contract on those models the design was frozen. Is there any difference, any tactical reasons why, if they could do it, we cannot?

The tactical reason was demonstrated by the British. The British were flexible in their design and they beat the Junkers and the Messerschmits. It is true the Germans did freeze. It is true they had quantities of airplanes, but the performance was inferior to the British.

Cutting Fluid Data—O. W. *Boston*

1. In general, cutting fluids should be applied (in large quantities at the highest velocity possible without splashing) directly onto the tool point where the chip is being formed. From three to five gallons for each single-point tool is most effective. Particularly when applied to carbide tools, the cutting fluid should flood the tool before the start of the cut and be applied continuously during the cut. Rapid change in temperature is injurious to most tools. The use of sulphurized oils on carbide tools is reported to be injurious to the tools.

2. Cutting fluids should be kept clean, that is, free from suspended chips, bacteria, and high acidity.

3. Cutting fluids should not be allowed to become too warm through use. They should be cooled if necessary to keep them below 110 deg. F.

4. For most metal cutting operations at high speeds, water emulsions of soluble oils should be used for long tool life on most steels.

5. On complicated machine tools, such as automatic screw machines, gear cutting machines, and other special machines, where the lubrication of the machine tool is influenced by the nature of the cutting fluid, emulsions may have to be made rich, say 10 parts of water instead of the normal 20 to 40 parts of water, or oils may have to be substituted.

6. On some jobs, as milling and drilling which are done at relatively high speeds, emulsions are many times replaced by oils in order to provide better lubrication of the flutes or chip space of the cutter to facilitate chip removal.

7. Sulphurized oils or oils containing active sulphur are recommended for machining tough steels where an emulsion is unsatisfactory. Oils containing a small amount of chlorine may be used on hard steels. Care should be taken, however, to make sure the chlorine is stable and unobjectionable.

8. On the low cutting speed operations, such as tapping and broaching where the elementary type of chip is formed, sulphurized oils for ductile steels or chlorinated oils for hard steels are effective.

9. In machining operations involving a number of types of cuts, such as turning, forming, threading, etc., the oil best suited for the most difficult operation, such as threading, is often necessary.

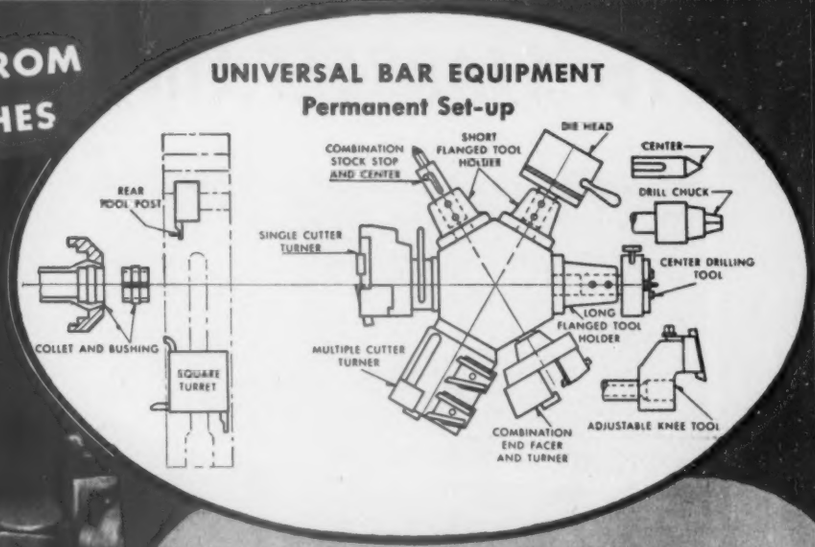
10. In machining brass which shows no change in cutting pressures with various cutting fluids, it is advisable to apply a cutting fluid to function as a coolant. Inasmuch as most free-cutting brass is machined in automatic screw machines, an oil is advisable. A paraffin or light mineral oil may suffice, or the mineral oil blended with 10 per cent fatty oil may be used to advantage. Sulphurized oil should not be used on copper and its alloys inasmuch as they tend to discolor the material.

11. Magnesium and its alloys should be machined with heavy feeds and tools kept sharp. For this reason, carbide tools are preferred for high production work. If the metal is machined dry, powdered asbestos should be kept available to smother flames should a fire start. Emulsions of water should not be used on magnesium, but, if a cutting fluid is desired, kerosene or a mineral seal oil is recommended.

12. In machining aluminum in high-speed operations, emulsions are generally used. To secure a high quality of finish, 10 per cent kerosene is added to the emulsion. For threading, a light mineral oil may be used.

13. In turning Monel metal, it has been found that an emulsion gives a slightly longer tool life than a sulphurized mineral oil, but that the latter produces broken-up chips which in many instances are very desirable.

GET MORE PRODUCTION FROM Old and New TURRET LATHES



THIS "PERMANENT SETUP"

Reduces Setup Time and Tooling Costs on BAR WORK

• After studying hundreds of turning jobs, these Universal bar tools, cutters and collets have been selected and are recommended by Warner & Swasey, as a permanent setup to handle wide varieties of bar work.

In this tooling plan the large flanged type tools remain mounted on the turret. This arrangement permits an infinite number of setups by simply (1) changing collets and bushings, (2) grinding cutters, (3) setting cutters, and (4) setting stops. Adjustable features on these bar tools quickly set cutters to new sizes. Only on extra long run jobs may it pay to change this tooling setup!

Check your turret lathes doing bar work against this recommended permanent setup. If you need additional Warner & Swasey Tools to adopt this time-saving setup, select sizes from your Warner & Swasey Tool Catalog.

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Turret Lathes
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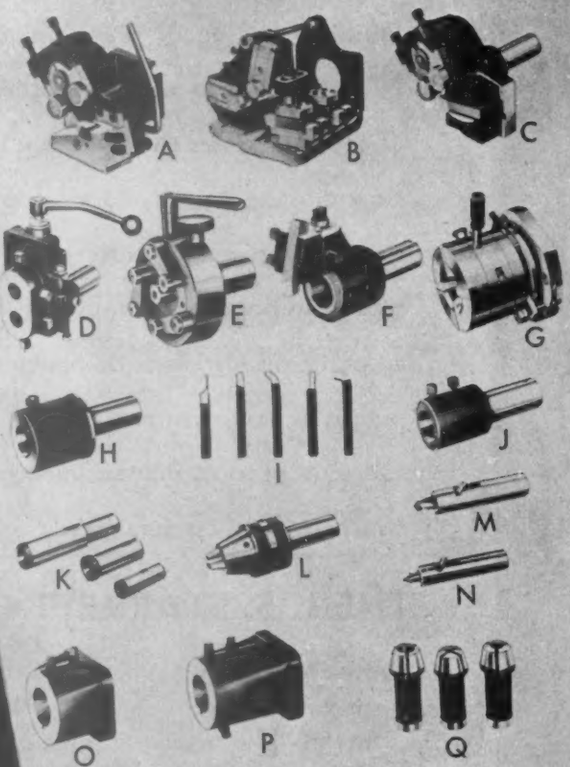
UNIVERSAL BAR TOOLS

A. 1 Single Cutter Turner or Universal Bar Turner
B. 1 Multiple Cutter Turner
C. 1 Combination End Facer and Turner
D. 1 Quick Acting Slide Tool
E. 1 Center Drilling Tool
F. 1 Adjustable Knee Tool
G. 1 Die Head
H. 1 Clutch Tap and Die Holder
I. 1 Set of Forged Cutters Square Turret
J. 1 Floating Tool Holder
K. 1 Set Taper Drill Sockets
L. 1 Drill Chuck
M. 1 Combination Stock Stop and Starting Drill
N. 1 Combination Stock Stop and Center
O. 2 Short Flanged Tool Holders
P. 1 Long Flanged Tool Holder
Q. 1 Set Collets or Collet Bushings



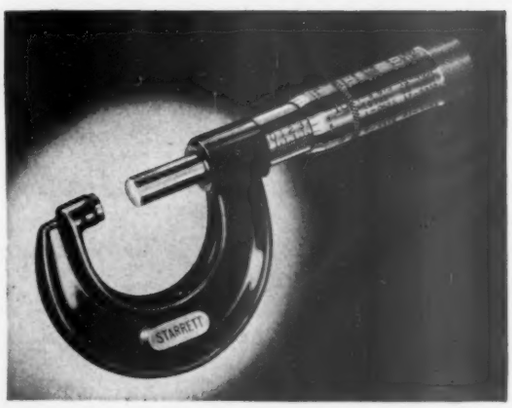
Complete descriptions of these tools are found in the Warner & Swasey Tool Catalog. If you do not have your copy, write for it.

YOU CAN TURN IT BETTER, FASTER, FOR LESS...WITH WARNER & SWASEY TOOLS

STARRETT TOOLS

The STARRETT LINE is stripped for ACTION

For more than 60 years, The L. S. Starrett Co. has offered tool buyers and users an almost unlimited selection of precision measuring tools. Now, in order to make available a larger supply of the more essential tools, we have eliminated slow-moving items, odd sizes and minor variations that have formerly been available. This change in policy will in no way limit the quality, accuracy or *usefulness* of Starrett Tools. It *will* permit us to concentrate our efforts on the types and sizes of tools that are most widely used and which are most essential in war production work.



STARRETT MICROMETER No. 436

This model can be substituted readily for many similar models temporarily discontinued from the Starrett line. No. 436 is available in six sizes, 1 to 6 in. inclusive. Rigid yet light black enameled frame, quick reading graduations, decimal equivalents on thimble, popular priced.

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PRECISION TOOLS • DIAL INDICATORS • GROUND FLAT STOCK

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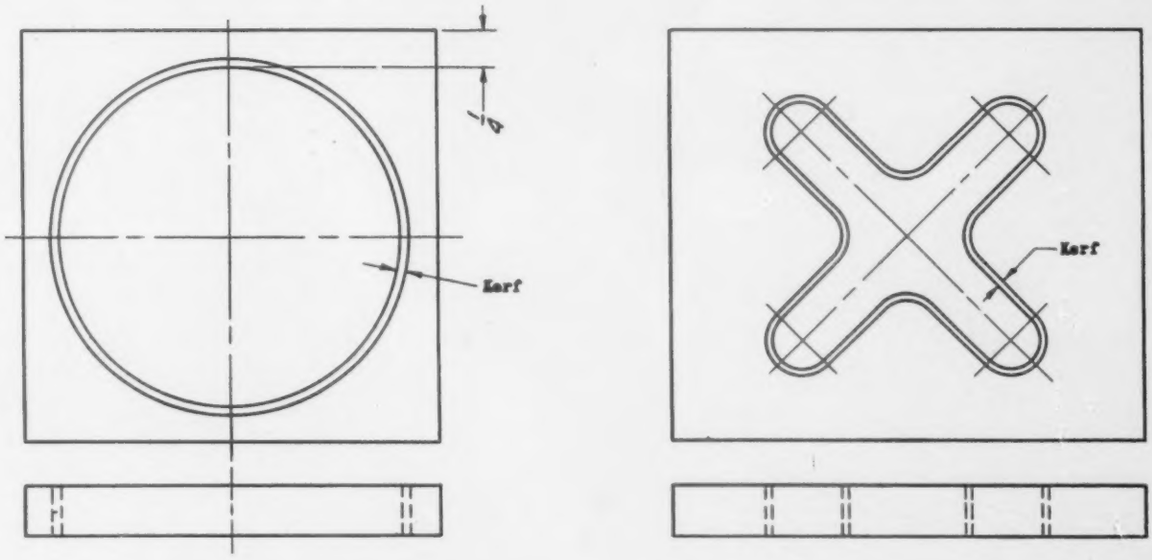
Tool Engineering DATA SHEET

FLAME CUTTING

Oxy-acetylene flame cutting has sprung into sudden prominence through its tremendous usefulness to the Tool Engineer who must speed production on vital war equipment. Broadly, what it will do is known to most engineers. In particular, there are details about which many engineers may be in doubt. This data sheet is provided to clear up problems concerning the approximate width of kerf and speed of cutting produced by oxy-acetylene flame on various thicknesses of steel. The illustrations show typical application.



THICKNESS—INCHES	1/4	3/8	1/2	3/4	1	1 1/2	2	3	4	5	6	8	10	12
APPROXIMATE Width OF KERF—In.	5/64	3/32	3/32	7/64	7/64	1/8	9/64	11/64	11/64	3/16	3/16	7/32	7/32	1/4
SPEED—In./Min.	20	19	17	15	14	12	10	8	7	6	5	4	3 1/2	3

Courtesy Acme School of Design, South Bend, Indiana

NOTE: This is the seventh of a series of Data Sheets which will be published in THE TOOL ENGINEER hereafter. A handy three ring binder can be secured at any book, stationery, or dime store and will hold the sheets for convenient and frequent reference.


SPLITTING THE CUT. The two tools, front and rear, compensate and eliminate strain. A clean, speedy job in one operation on an 18" Lodge & Shipley Manufacturing Lathe.
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WE FLY THE ALL NAVY "E" PENNANT
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PRODUCTION PERSPECTIVES...

News, Review of Mass Manufacturing

Production

MORE than 20,000 machine tool units, valued at $85,000,000—that's the tool industry's accountable monthly contribution this early in 1942 to War Production's goal of 45,000 tanks, 60,000 planes, 20,000 anti-aircraft guns and 8,000,000 tons of shipping for the year.

Not so easily totalled, but equally important, is the Tool Engineers ingenuity exercised toward increasing efficiency of machinery already in production, and of finding new uses for old machines.

A tool salvage company reports receipt of a cutting tool—dated 1912—for restoration. The tool will not stand much show against 1942 metals and jobs, but it can do something, where nothing might otherwise be the case. The scrap bins are paying better dividends than this example might lead one to believe, however.

An automotive firm chipped the rust off 50 antiquated machines which had been consigned to the "graveyard" as many as twenty years earlier. Among these was a 30-ton Ingersoll planer type mill, which has been set to machining tank parts. An ancient cylinder grinder has been adapted to a grinding operation on aircraft engines.

Further, Tool Engineers have introduced mass production to the tool-making business. Because of the difficulties of obtaining expert toolmakers, who require five or six years training, production managers at Willys-Overland were faced with the problem of using semi-skilled labor to turn out intricate gun parts. Approximately 30 hours of expert hand filing was required after machining was finished on each piece. To get out 10 guns a day would take 300 hours, or 37.5 tool-makers per day. The operation was broken down. In place of having one man file 30 hours, approximately 30 men filed for one hour each. It was necessary only to educate each man for a small part of the total filing, in which he could become proficient in 30 days.

In an open letter to major prime contractors, dated April 15, Donald M. Nelson asked that more work be spread among other firms, whenever deliveries can be hastened by this policy. "More subcontracting will help win the war," the letter stated. A week earlier, Price Administrator Leon Henderson had cleared a stumbling block for subcontracting for the Norton Company of Worcester, Mass. By approving a 3.8% increase in the maximum price for 150 Model No. 26

"GREENIE" — 'Twas always so

Hydrolap Machines, Norton was able to cover additional costs in production and sale of the units built by other companies. A similar order was passed, facilitating manufacture of production drilling machines by Defiance Machine Company of Defiance, Ohio.

"Production lines are battle lines," said Mr. Nelson. "Let's use all the production we've got." And that ties in with an interesting story on conversion, where a conveyor and assembly line have been mechanized, just as has the battle line.

Conversion

Conversion is a broad term, and it covers more than taking a tool off one job and adapting it to another. It covers facilitating the change-over, getting the job to the plant, even though actual plant equipment may be pretty well suited to a war job as is. That's also a distribution problem, but in its relation to the national effort, it's conversion in the best sense of the word. And that's where the story of a "mechanized" assembly or conveyor line comes in.

Over in Michigan's Irish Hills, a motor truck loaded with 20,000 small iron castings rolls from one factory to another, stopping at six different plants in three cities. The daily round trip totals 125 miles. This came about after an automotive supply company undertook manufacture of a certain shell, and discovered that the small "fuse hole plug" required casting, annealing, machining cadmium plating and thread protectors before it could be assembled in the shell. The prime contractor lacked equipment for these operations. But firms which could handle the work were found in towns as far distant as 55 miles. A truck route was charted, beginning at the foundry which was located in the prime contractors home town. Each morning, the truck picks up 20,000 castings from the foundry, delivers them to the annealing plant, where it takes on a similar number of annealed pieces, and so it proceeds on its rounds. At the plating plant, thread protectors, which are delivered via a motorized "sub-assembly line" from a plant 70 miles distant, are added. Actually, such long distance assembly lines are not new. More than 15 years ago, Henry Ford started his village industry project, where small plants were organized within a sixty mile radius of the huge Rouge plant to supplement production on automotive parts.

Concerning conversion of machine tools in the sense of adaptation to new tasks, every plant or company has reports like this: A transmission pinion for a light vehicle has been regularly produced on a sequence of 39 machines, including 194 tools, dies, jigs and fixtures, 153 precision gages, some furnaces and straightening presses. Came war and a new job—to mass produce pinions for tanks, whittling down a 3-foot, 125-pound bar of forged steel. "Tooling up" this conversion job begins with scrapping the forging and trimming dies, each set of which required about 600 manhours to make. They were built to shape a 6-pound billet. And you throw aside all the tools, dies, jigs and gages. What you have left are the machines and the "know-how" required to re-arrange them.

MOLYBDENUM ENLISTS FOR THE DURATION

The enormous increase in requirements of molybdenum has necessitated the War Production Board Order M-110, placing molybdenum consumption under allocation control...Our metallurgical research staff is fully engaged in war work. At our mine, mill and converting plant, every effort is being made towards maximum production.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.
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MOLY

Practically every machine tool builder is today actively converting to a 24-hours-a-day, seven-days-a-week basis, George H. Johnson, president of the National Machine Tool Builders' Association and president of the Gisholt Machine Co., told machine tool builders at the Spring Meeting of the Association held at Chicago.

"All of the reasons," Johnson said, "which any one of us might bring forward to explain why some of our machines are idle eight hours out of 24 or on Sunday would seem pitiful to an American private helping to hold Corregidor. We in this industry must do what it seems impossible to do. We must get and hold 168-hour operation."

Continued occupational deferment from the draft is by no means assured, Johnson said. The industry must be prepared to employ and train men beyond the draft age, men with many dependents, men with physical impairments and women. We will be particularly grateful to designers and engineers who over the last ten years have contrived to plan machine tools in such a way that their operation involves the use of push buttons and easily handled levers rather than the exercise of muscle."

Labor

There's been considerable talk concerning vacations —whether they should be taken or not. Here's WPB's policy: "Experience here and abroad is indicating that the worker, even when stimulated by the urgency of the Allied war situation, cannot work long hours and maintain peak output indefinitely . . . After the extensive overtime and the added emotional strain of the war effort, we can be sure some rest period this year is going to prove doubly effective in the restoration of his energy and determination . . . It is particularly necessary that American industry show its ingenuity in securing the vacation benefits without paying a counterbalancing cost in productive hours lost.

More than 500 American firms have organized labor-management committees to consider and foster ways of improving production output. This is in accord with the production drive. Part of this effort is devoted to facilitating workers' transportation, conserving consumption of gas and rubber.

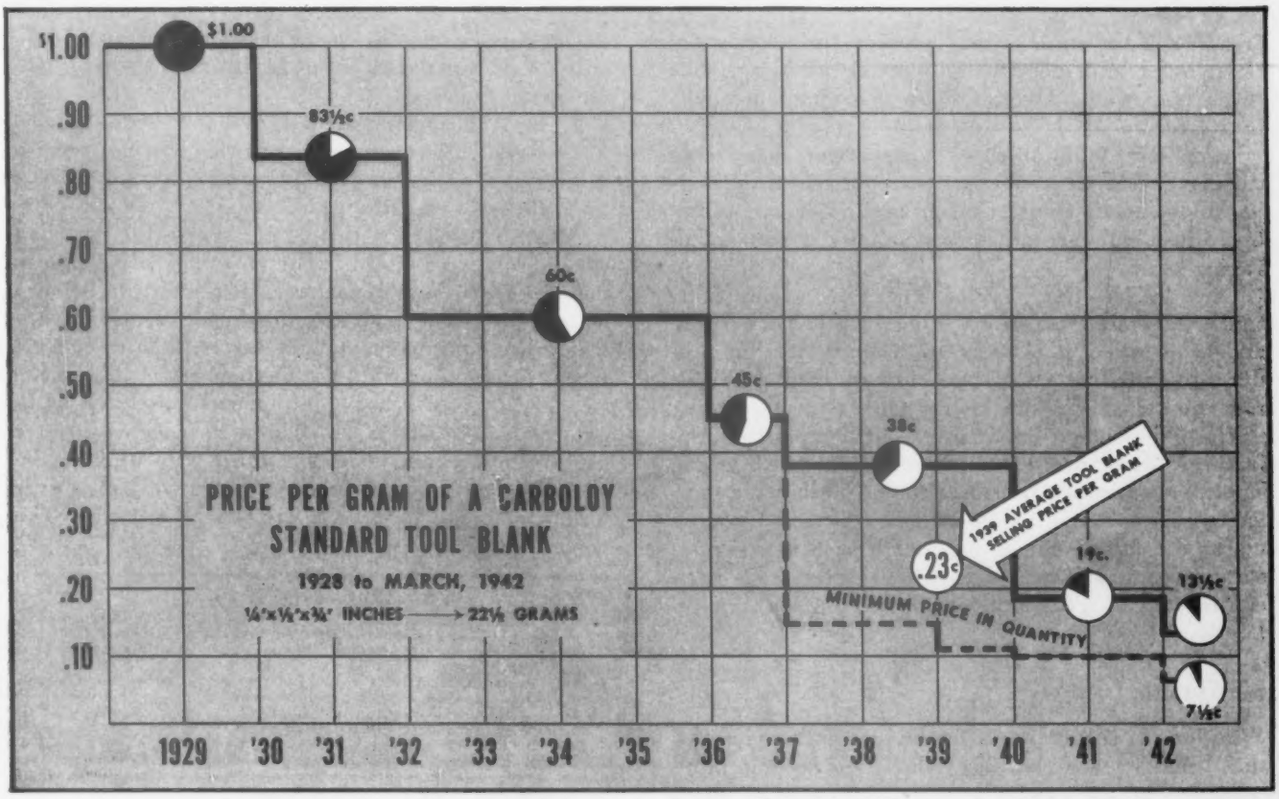
Ten employes of the Barber Colman plant in Rockford, Ill., bought and rebuilt a hearse using it for transportation to work to save their tires. The Baldwin Locomotive Works at Eddystone, Pa., reports that their workers have organized a co-operative bus service.

Noticeably lacking from this month's labor news are the reports of jurisdictional labor disputes. In fact, more stress is being laid on man-hours lost through industrial accidents.

Expansion

Construction costs for 1942, it is estimated, will exceed $13,000,000,000. Of this sum, hundreds of units of 3, 4 and 5 millions are being expended all over America for tool shops—new or as additions to present structures.

The Farrell Birmingham Company of Ansonia, Conn., is one which is putting up a new plant in north-



WHAT PRICE CARBOLOY?

Since October, 1928, Carboloy Company, Inc., has continuously passed on to industry, savings in cost that could be effected without detriment to the broad development program being carried on. Under this policy—despite years of profitless operation—a total of seven price reductions were made. Beginning in 1930, the price of a 22½ gram standard Carboloy tool blank, for example, has been steadily reduced from an original $1.00 per gram—to as little as 7½c per gram today. In larger sizes minimum prices per gram are even lower. Prices of complete Carboloy standard tools are now close to the best grades of steel tools.

Background for this development has been the worst depression in the nation's history—poor years for the costly development work needed. But from that work have come vast strides in processing—refinements of the original carbide—many new carbides—new machines, new grinding wheels, new techniques of design, application and maintenance—extensive training of manpower.

Today—in the midst of the most crucial production era in its history—America is reaping the benefits. It has the *domestic capacity* to produce—is actually producing—vital carbides in unprecedented quantities—completely independent of *outside* manufacturers. It also has the *knowledge* to employ those carbides effectively—to obtain performance in the order of 20 to 1 over ordinary tools.

Contributing largely to reductions in cost has been the steady trend towards standardization and mass production techniques. Originally, practically every piece produced was "hand made." Today, automatic presses—operating 24 hours a day—are turning out thousands, millions of blanks for the nation's war plants. A large proportion of Carboloy production is now standard. Continued effort is being made to further divert special requirements into standard lines. For, greater standardization means greater output—greater economy—greater aid towards victory. ★ ★ Carboloy Company, Inc., Detroit, Mich., Chicago, Cleveland, Los Angeles, Newark, Philadelphia, Pittsburgh, Seattle, Worcester, Mass.

CARBOLOY

Reg. U. S. Pat. Off.

TOOLS • DIES • GRINDING WHEEL DRESSERS
CORE BITS • MASONRY DRILLS • WEAR PARTS

MANUFACTURERS OF TOOLS, GAUGES, ETC., SUPPLYING PRODUCTS TIPPED WITH CARBOLOY CEMENTED CARBIDES

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Morse Twist Drill & Machine ..... New Bedford, Mass.
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J. S. Pepper, Inc. Union City, N.J.
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Sheffield Corp. ..... Dayton, Ohio
Ralph Shipman ..... Sunbury, Pa.
Simonds Saw & Steel ..... Fitchburg, Mass.
Landon P. Smith, Irvington, N. J.
Sommer & Maca Glass Machinery ..... Chicago
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Standard Gage, Poughkeepsie, N.Y
Standard Tool ..... Cleveland
Staples Tool & Engineering ..... Cincinnati
L. S. Starrett ..... Athol, Mass.
Strauss Co. ..... Pittsburgh
Super Tool ..... Detroit
Truber Tool ..... Yonkers, N. Y.
Tungsten Carbide Tool ..... Detroit
United Twist Drill & Tool, Chicago
Van Keuren Co. ..... Boston
Harry W. Wagner ..... New York
Walken Tool ..... Cleveland
Wendt-Sonis Drill Wks. ..... Hannibal, Mo.
Wesson Co. ..... Detroit
Wetmore Reamer ..... Milwaukee

ern New York state. Plans provide for a one-story steel, brick and glass manufacturing building, with three craneways. Overall floor space measures 603 by 203 feet.

Allegheny Ludlum Steel Corporation has made sufficient research over a ten year period into salvaging alloy metals from grinding and other machining operations, to warrant construction of a metals salvaging plant.

Carbide Tool Company of Chicago is adding 6,500 square feet to its plant, investing $200,000 in carbide and high speed steel machining equipment to produce milling cutters, form cutters, counterborers, reamers and special production tools.

The Independent Pneumatic Tool Company, manufacturers of Thor portable Pneumatic and Electric Tools, is continuing its expansion of nationwide service facilities. The opening of a new Detroit building marks the completion of the fourth such new service station within the past 15 months. Others have been constructed in Philadelphia, San Francisco and St. Louis.

Materials

Lessons in economic geography are not the least of the things we are learning today. We become more conscious of the origins of everyday facilities when we find out that we can't have something, or our use is to be restricted. If you cannot get your favorite orchestra's recordings you can chalk it up to a shortage of shellac, and you can chalk that up to the difficulty of getting things out of India. That's where shellac comes from.

Though May steel plate output is forecast at 900,000 tons, users with excessive inventories will not receive allocations for that month. Demand continues at least 50% ahead of record output.

About 500,000 tons of steel per year is the expected saving following curtailment of metal office equipment and household furniture. It remains to be seen what Tool Engineers can make out of machinery which the equipment manufacturers hope to convert to war production. Oddly enough, much of it has been switched over with good results, and sometimes without too much alteration. There has always been a kinship between a typewriter and a gun—though the age-old question of the relative power of words over bullets seems to have been pretty well settled by the government.

STEEL SUBSTITUTION

Tool designers have been asked by the War Production Board to help meet the problems arising from extreme scarcity of certain types of steel.

There is a real shortage of alloys. Many of the present specifications are impossible to fill.

Before he sends out a print, a tool designer should review the available steels. This would save delay and confusion caused by sending out prints calling for types of steel which cannot be obtained. In many cases substitutions can be made. In some cases they must be made.

Often a fabricator suggests a substitution, based upon his knowledge of the steel situation and upon experience which dates back to the time when present types of steel were not made and other types were satisfactory. These former types may be available and acceptable.

An impression that HS Moly steels are not HS steels should be corrected. HS Moly steels ARE HS steels. The supply of any HS steel is very critical and designers should substitute other types whenever possible.

Designers can greatly speed up the tool situation by taking these factors into careful consideration right at the start.

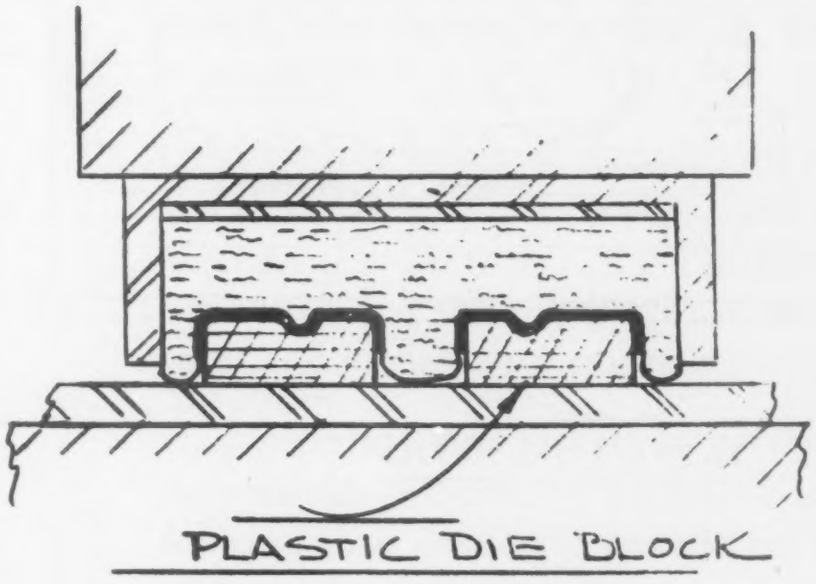
Rapid Tooling
with cast plastics

DR. K. J. LEEG, Ph.D
Director of Research, Plastics Division
Baker Oil Tools, Inc., Los Angeles, Cal.

Plastic dies applicable to metal forming offer Tool Engineers possible advantages in rapid tool production and low tool cost

SYNTHETIC resins and plastics have been used by a western tool manufacturer* for many years in the production of oil well cementing tools. When used with due consideration of their applicability, these materials have been found to be excellent for some structural equipment. A few years ago the idea was conceived of using cast phenolic plastics and a great deal of research and development work has brought about a resin which is now used to advantage in numerous oil tool specialties.

More recently, development work has been carried out on the application of this casting resin to certain tooling operations, both in oil tool manufacture and in other industries. Cores and molds of plastic are used in the manufacture of plastic parts for oil tool equipment.



HYDRO-PRESS DIE

Figure 1

Hydropress Dies

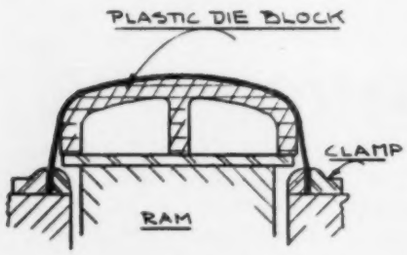
This led to the suggested use of the plastic for the making of dies for metal forming. Several companies were interested in this possible application and some of them submitted molds to be used in making dies for hydropress work (See Figure I). In some cases as many as eight or ten plastic dies were made in one plaster of Paris mold before breakdown of the mold resulted.

These dies were tested in production in the forming of both aluminum and stainless steel in the hydropress. Stainless steel as heavy as .040" has been formed with no noticeable breakdown of the dies. The dies have particular advantages in that the sharp corners do not round off; they are easy to handle, light in weight, and easily and rapidly produced. A plastic die can be made from the pattern in from eight to twenty-four hours, and ordinarily will require only a very few man-hours of labor; thus, making the material of considerable interest from the standpoint of increasing production rates.

In addition to the increase in production rates brought about by the short manufacturing cycle for produc-

*Baker Oil Tools Inc, Los Angeles.

ing the dies, production rates are also increased by the fact that the plastic die is quite light in weight. This allows for easy handling and decreases fatigue of the worker. The plastic has a specific gravity of about 1.25, and therefore, very large dies are light enough to be moved from place to place by hand, which saves considerable time by avoiding the use of cranes and heavy equipment.



STRETCH PRESS DIE

Figure 2

Several Dies Per Mold

Where mass production is necessary, the plastic can save additional time by the use of several identical plastic dies. This is possible because one mold can often be used for the casting of several dies, which are, therefore, identical. Since the cost of making these dies is relatively low, the amortization cost on the part is not increased appreciably by the making of several dies.

After the work on hydropress dies had progressed fairly well, it was suggested that stretch dies be made of the plastic. This field is particularly applicable to the use of the plastic because of the large size of die necessary for stretch press work. These dies are ordinarily 2 to 3 feet long by 1½ to 3 feet wide by from 6 to 18 inches deep. A die of this size, when made of metal, is extremely heavy, which makes it difficult to handle and difficult to store.

Plastic dies for this application were made and tested in production, proving that the expected results could be secured. (See Figure II). It was demonstrated in subsequent work that the die could be cast hollow by using a removable core, thus saving some material and a great deal on the weight of the die.

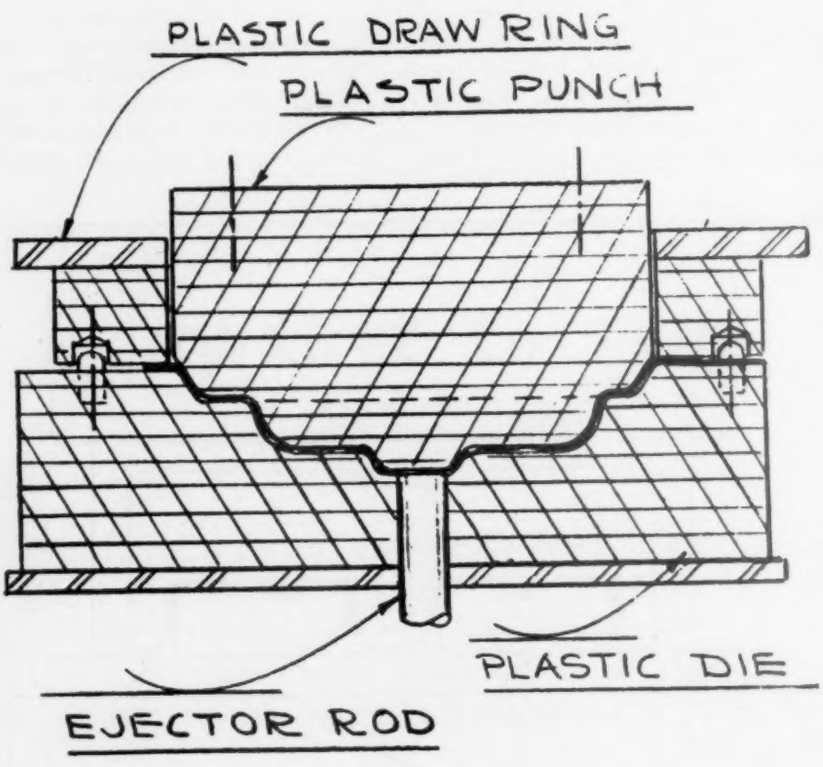
Specifically, dies of approximately the size mentioned previously can be made with a total weight of from 200 to 300 lbs. The load applied to such a die is very small; therefore, a cored die is perfectly satisfactory provided that no large overhang of the die over the bed of the press is allowed. This is essential in the case of plastic, as it is in the case of other materials, because a large overhang would allow for too much bending stress and would be likely to break a cored or even a solid die.

It is relatively simple to avoid this, since only one dimension of the die must be considered because the stretch press is always longer than the die that is to be used in the press.

If three or four heavy pieces of boiler plate of different widths are obtained and one is chosen in each case so that the overhang of the plastic over the edge of the boiler plate will not exceed 1 or 2", no difficulties will be encountered. With this much tolerance allowed, three or four pieces of boiler plate will cover the complete field of widths necessary for stretch press work. Following these rules, stretch press dies of plastic have been used and have done the job satisfactorily.

Double-acting Presses

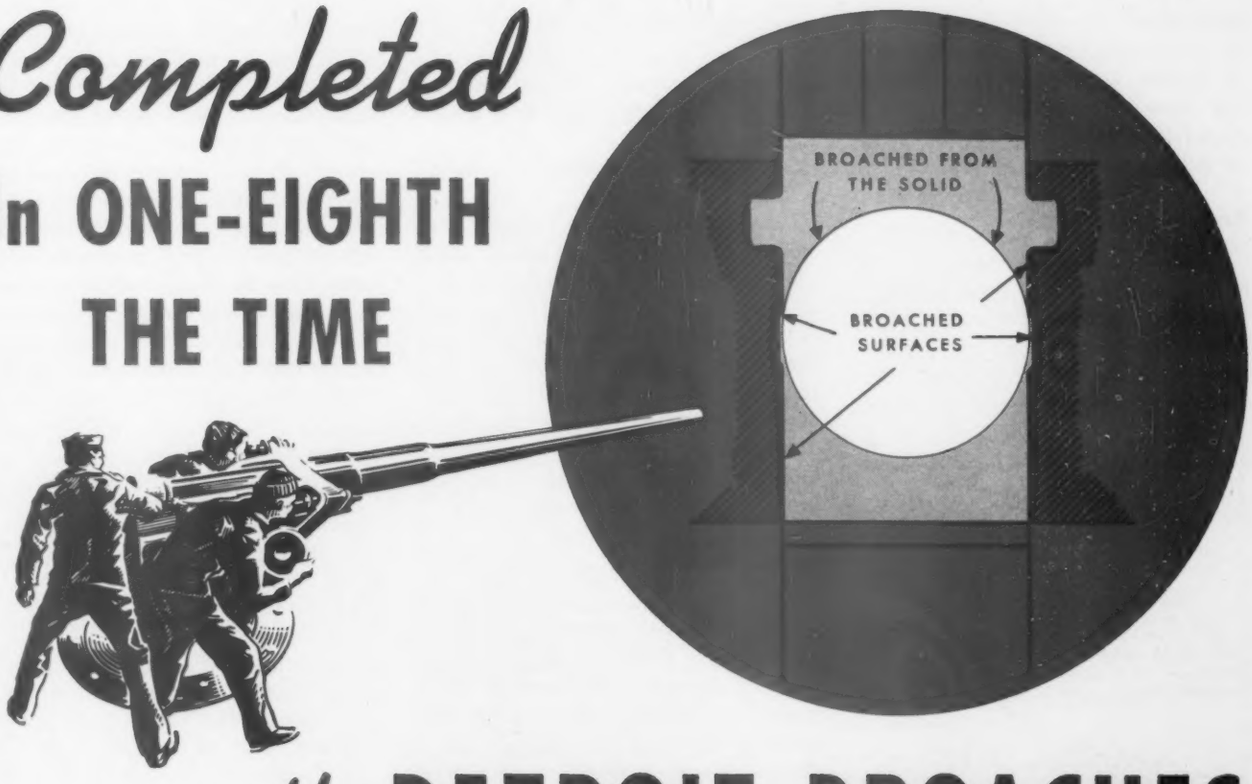
About the time that development work started on the stretch press dies, work was begun on the use of the plastic for making drawing dies for double-acting presses. (See Figure III). This is a rather severe application for the plastic, and an excellent test for its strength in production. Work has not been completed on this



DRAWING DIE FOR DOUBLE ACTING PRESS

Figure 3

Completed
In ONE-EIGHTH THE TIME



with DETROIT BROACHES

● The surfaces shown in actual contour in the above sketch are those broached in the breech housing of a naval gun.

By methods formerly employed in producing the part, portions of it were milled and the remainder were shaped. The surfaces were finished by hand scraping. By broaching the job is done IN ONE-EIGHTH THE TIME required for the operations previously employed.

Never before has speed in production been so vitally important. Broaching with Detroit Broaches can assure faster, more accurate results on many of your metal-cutting operations.

DETROIT BROACH COMPANY
20201 SHERWOOD AVENUE • DETROIT, MICHIGAN

application, but every indication at the present time is that the plastic will be entirely satisfactory for this use. Dies have been made for the double-acting press and in test runs held up quite satisfactorily

Toggle Press Forming

The plastic has also been used in making dies for toggle press forming. Here again we have a very severe application for the plastic, but preliminary investigation has indicated that the plastic is strong enough to do the work. On the basis of successes encountered in the forming of metal, suggestions were offered that acrylate sheets might well be formed with plastic dies (See Figures IV & V).

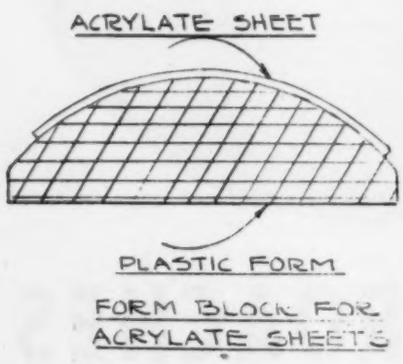


Figure 4

The first die made was one for a simple curve which required only a lay-over type die; that is, the simple curve required in the finished acrylate sheet was of such large radius that no clamping was necessary to obtain satisfactory forming. Dies for the forming of acrylate sheets must have the special properties of uniform and rapid heat transfer to allow for the cooling of the acrylate sheet in rapid production work. The cast phenolic dies answered the requirements satisfactorily.

Making the Mold

Wooden dies for acrylate sheets do not show uniform heat transfer because of the fact that the die must be made of several pieces and the joints show different heat transfer than does the body of the wood.

The mold for the casting of the liquid phenolic can be made of many materials. Some examples of materials that have been used are: plastic, rubber, latex, wood, glass, plaster of Paris, hydrocal, bronze nickel-plated iron, tinned iron, and other materials.

In general the making of a mold follows this procedure:

The pattern is made, usually of wood or hydrocal, of the article with allowance made for a single shrinkage of about 0.10″ per foot. If the mold is to be made of plaster or hydrocal, the pattern is coated with oil and the plaster is cast around it with the usual care of determining the parting line. The pattern is removed, the mold is lacquered, and it is then ready for the production of plastic pieces.

Latex Mold

In order to make a latex mold, the pattern is coated with from twenty to forty coats of latex, and then a rough plaster backing is cast around it. This type of procedure is used where under-cuts occur in the casting. The plaster backing is merely a support for the latex mold. After the latex mold is made, it is peeled off the pattern and it is then ready for production.

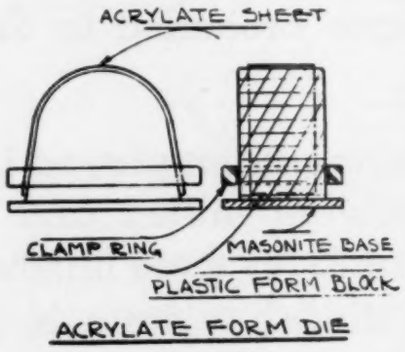


Figure 5

To increase the life of a latex mold it can be lightly coated on the inside with lacquer to serve as a parting medium. The lacquer can be applied by dipping the latex mold in lacquer that has been thinned with seven or eight parts of thinner.

If the mold is to be made of plastic, double shrinkage should be allowed in the pattern. The pattern is lacquered, the mold is cast around it, the pattern is removed, the mold is lacquered, and it is then ready for production.

Glass molds are very satisfactory, but are ordinarily not obtainable in useful shapes. In some cases where the shape of the casting is not critical, glass molds can be found that can be used. Brass and bronze molds are more expensive in that they must be cast and then machined. However, for large numbers of pieces they are sometimes the best available material. Tin or tinned iron molds are quite satisfactory, but have relatively short life. Iron molds are not satisfactory unless they are nickel-plated or lacquered.

Baking Temperature

After completion of the mold, the desired amount of plastic, as calculated by the volume of the mold, is mixed and poured into the cavity. The mold is then placed in an oven at a temperature of 100 to 170° F. and baked until set. The higher temperature gives rapid setting and a somewhat stronger product, but also gives a product with greater shrinkage.

If a minimum of shrinkage is of prime importance, the plastic can be set at a temperature of 100 to 120° F. for a period of from one to four days, and a shrinkage of less than .002″ per inch can be realized. However, if production is desired, the higher temperature should be used, and the plastic ordinarily will set in about two hours. In this case the shrinkage will be about .10″ per foot. In order to mix the plastic in preparation for molding, about nine parts of resin are mixed with one part of catalyst and then filling material is added to as high as 35% of the finished article.

The most common filling material used is walnut shell flour, used primarily to decrease the cost of the plastic. After the mixing is completed, the liquid plastic is poured into the mold and brushed in much as one would brush in plaster of Paris. The mold is placed in the oven and the plastic baked until hard. After this baking procedure, the plastic piece is removed from the mold, lacquer is removed if it was used in preparing the mold, then new lacquer is applied, and the mold is ready for another casting.

Plastics' Limitations

In considering the field of casting resins, we must also consider the limitations which must be imposed on the plastic. First, the plastic shows a

mold shrinkage due to its coefficient of expansion and to the fact that it is set at an elevated temperature. With reasonable control of the oven this shrinkage is fairly constant and allowance can be made for it; nevertheless, it must be taken into consideration. Second, a very small amount of increased shrinkage takes place in the plastic over a period of years after casting. Third, one must not consider plastics for a given application without engineering the application according to the physical strength of the plastic.

Physical Strength

The plastic does not have the physical strength of most metals, although in some cases, its strength-weight ratio is better than that of most metals. Fourth, it is not impervious to all chemicals.

In general the chemical resistance of the plastic is very good. It is resistant to practically all organic solvents, esters, acetone, keytones, chlorinated solvents, ring hydrocarbons, straight chain hydrocarbons, aldehydes, phenols, alcohol, water, dilute acids, and organic acids. It is slowly attacked by strong acids in general and by dilute alkalies. It is fairly rapidly attacked by concentrated oxidizing acids and by strong alkalies.

A chart of physical strength of the plastic is given at the end of the article. Where fillers are used, the strength and in some cases the chemical resistance is partially dependent on the strengths and resistance of the fillers involved. However, it has been found that walnut shell flour is a very satisfactory filler and that it changes very few of the properties of the plastic.

The liquid casting resin which the aforementioned western firm uses has shown that its greatest field of usefulness will probably be in industrial applications. It has shown excellent properties in the manufacture of tools for the forming of thin sheets of metal and the forming of most plastics. It doubtless has many more applications in tooling that will come to the fore with increased knowledge of the applicability of the plastic.

Work is being carried on at the present time to adapt and develop liquid casting resins for broader fields in an attempt to make production easier at this time when rapid production is so essential.

Physical Characteristics of Plastics Used in Rapid Tooling

		"A"	"B"
Mold Shrinkage—in./in.		0 to $8x10^{-3}$	$8x10^{-3}$
Specific Gravity		1.21	1.17
Specific Volume—$in.^3/lb.$		22.8	23.7
Tensile Strength, $1/4"x1/2"$ Sample—$lbs./in.^2$		7000	3600
Elongation—%			
Modulus of Elasticity in Flexure at stress of 1000 $lb./in.^2$, in $lbs./in.^2x10^5$		2.6	2.6
Compressive Strength, lbs. per sq. in.	Yield Point	9000	8100
	Ultimate	9600	8500
Flexural Strength in pounds per sq. in.		9600	4000
Shear strength—$lbs./in.^2$		4500	3800
Impact Strength per inch of notch—$1/2"x1/2"$ notched bar, Izod Test, ft. lbs.		.18-.36	.18-.36
Rockwell Hardness, 60 kg.—1/4" Ball			
Thermal Expansion, in. x $10^{-5}/in./C°$		9.3	9.3
Resistance to Continuous Heat—°F.		160°	160°
Softening Point		None	None
Distortion under Heat			
Tendency to Cold Flow		None	None
Water Absorption			
Burning Rate		Nil	Nil
Effect of Age		Hardens & Darkens	
Effect of Sunlight			
Effect of Weak Acids		None	None
Effects of Strong Acids		Slight except oxidizing acids	
Effects of Weak Alkalies		Slight	Slight
Effects of Strong Alkalies		Decomposes	Decomposes
Effects of Organic Solvents		Negligible	
Effect on Metal Inserts		None after hardening	
Machining Qualities		Good	Excellent
Clarity		Opaque	Opaque
Color Possibilities		Good	Dark Colors

Physical Test Procedures

Tensile:

Samples are cut from a 5"x2"x1/2" molded slab in such a manner that the finished sample resembles a dumbbell. The ends are made to conform to a standard neat cement tensile briquet and the center 1¼" has a cross-section of ¼"x½". The samples are tested on a standard neat cement tensile machine at a loading rate of 600 lb./min.

Compression:

Compression samples are molded in a bar 1⅛" in diameter and 4" long. Two standard ASTM samples, 1¼" long, are cut from the bar. These specimens are loaded at a rate of 0.05 in. per min. of the crosshead.

Shear:

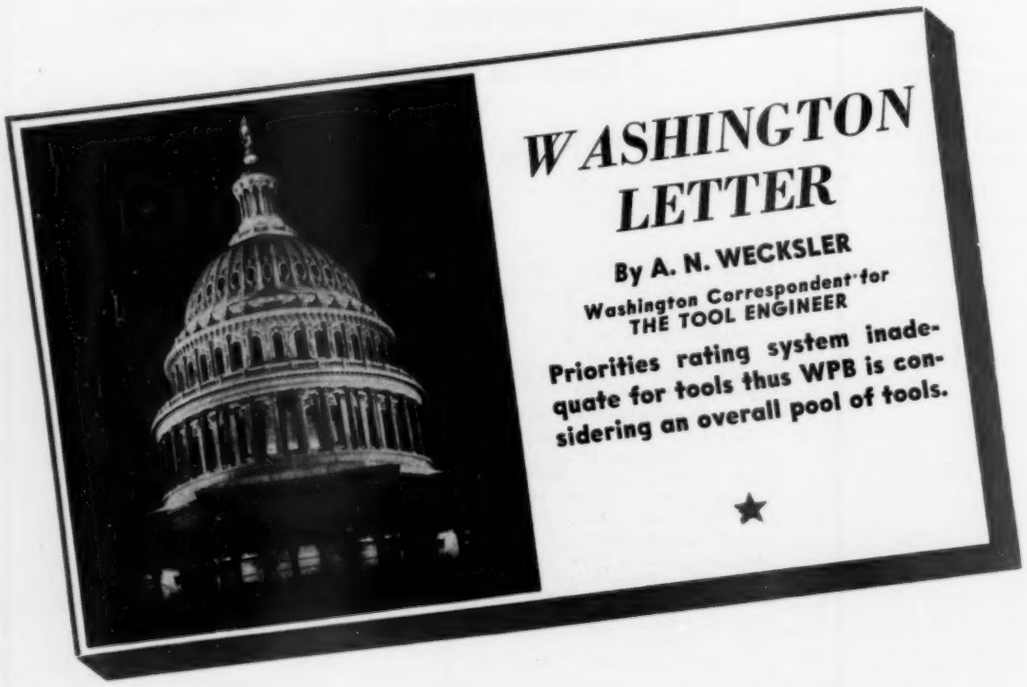
Shear samples are discs ½" thick by 1⅝" diameter and are cut from a cast bar, 1⅝" diameter by 4" long. These discs are placed in a close-fitting cylinder which has a $\pi/3$ diameter hole in the bottom end. A bushing, also with a $\pi/3$ diameter hole in it, is screwed down on top of the disc. A piston is placed into the bushing and loaded until a plug is sheared from the disc. The circumferential area of the plug is considered as the shear area. The piston is loaded at a rate of .05 in/min of the cross head.

Impact:

Standard A.S.T.M. Izod notched bar specimens are cast in a gang mold. They are broken on a 50 in. lb. capacity Tinius Olsen impact machine.

Shrinkage:

Shrinkage samples are cast in a mold ½" wide x 5" long x 2" deep. The molding shrinkage is considered to be the difference in lengths of the samples and the mold at room temperature.



WASHINGTON LETTER

By A. N. WECKSLER

Washington Correspondent for THE TOOL ENGINEER

Priorities rating system inadequate for tools thus WPB is considering an overall pool of tools.

Major limiting factor in war production continues to be the supply of tools, with all indications pointing to a War Production Board policy of awarding contracts on a tool basis.

This policy will be centered around the need of filling out existing production lines as a means of speeding up delivery of war goods. The current holders of prime contracts now have accumulated supervisory and production experience, and of more importance, a nucleus of the machine tools required for further expansion.

Extensive Adaptation

Of the plants whose civilian production is being stopped by WPB order, relatively few are capable of swinging into major war production without extensive adaptation of their plant facilities, and addition to their tools. However, where such plants have a portion of the tools required for production of bits and pieces, they can be used to fill out existing production lines.

The problem of tooling up additional plants to undertake major prime contracts will be one of rationing tools to plants in the process of converting.

Obviously, with machine tools in short supply, controls over allocation of tools will become an increasing factor. The aim will be to award contracts first to such plants as require a minimum of tools to undertake specific contracts.

The priorities rating system insofar as tools are concerned has become unwieldy and inadequate, due primarily to the fact that the plant facilities of a large percentage of civilian industry affected by production bans are suitable to war output, but tools are lacking. Such plants could be awarded contracts and assigned high priorities ratings to obtain required tools.

Old System Out

This practice, by the index of past experience, would mean that tool builders could not maintain reasonable schedules of delivery, as the rush of orders carrying priorities ratings all in the upper brackets would exceed their top capacity of production.

Recognizing these factors, WPB is considering the tool production capacity of the nation as an overall pool, and is planning to apportion the output on a percentage basis to the Army, Navy and Maritime Commission. This will enable the contracting officers of the military arms to know definitely what tools are available for delivery.

Overall Tool Pool

Instead of assigning a priorities rating entitling a contract holder to purchase tools, which may or may not be effective, the contracting officer will be in a position to actually assign both a contract and the necessary tools to fill it, to a successful bidder.

Able to Rate Plants

As contracts now are largely assigned through negotiation, rather than the previous practice of advertised bids, the contracting officers will be able to rate a plant, estimate what additional tools are required, and if the manufacturers' facilities and available tools are acceptable, to award a contract and assign an order on required tools.

One factor that now is becoming of immediate concern is shortage of power. Already all available large blocks of industrial power have been contracted, and new plants requiring power will probably be located in municipal areas where the plants can draw on civilian power output at the expense of the civilian consumer.

War Industry Absorbs Power

While it is true that the shutdown of civilian industry plants will free considerable blocks of power, war industry needs will quickly absorb this power in so-called defense areas.

The problem of materials as it affects war industry is mainly concentrated in alloy steel, the alloying metals, and the non-ferrous metals going into direct war materiel. Sharp limitation on civilian use indicated that a sufficient supply will be available to war industry. However, the question of distribution still

remains.

Generally, it is planned to distribute materials to industry on a three-month inventory basis through the Production Requirements Plan, which is an indirect approach to allocations.

Some Exceptions

The Office of Price Administration has granted several exceptions to terms of the Machine Tool Price Schedule No. 67, permitting sale of tools at prices higher than the October 1, 1941, levels, where high cost producers can demonstrate that they cannot operate profitably under the price schedule. It is indicated that such exception will only be granted when the tool involved is critically needed in war production, and after careful study of the profit position of the producer.

WPB actions of direct concern to the tool industry are:

March 25—Appeal by C. E. Adams, chief of the Iron and Steel Branch, to all steel plate consumers to forego all but their most urgent requirements. Request based on the fact that only buyers are in a position to know how urgent their orders for plate are. Mills are unable to judge which is most needed as between two orders carrying equal priorities ratings. While production of plate is at peak, demand is at least 50 percent greater than output.

March 25 — Interpretation No. 1 of Conservation Order No. M-61, covering Madagascar Flake Graphite (reserving flake graphite for use in making crucibles at specific permission of WPB), permits use of the Madagascar Flake Graphite "fines" in steel making to make stoppers.

March 26 — General Preference Order E-1-a revised to exclude drill chucks from the types of chucks controlled under the order. Revision specifies that no purchase order received after March 25, 1942, for any machine tool shall be given priority standing in production and delivery schedules unless a preference rating has been assigned to it by a PD-1A, PD-3A, or P-19-h. Delivery of the preference rating itself is no longer required, but each purchase order must carry the proper endorsement prescribed by PD-1A, PD-3A, or P-19½-h. Purchase orders for gages and chucks shall be scheduled only upon receipt of a preference rating assigned to them by a preference rat-

(Continued on page 156)

Carbide segregates in high speed tool steel demand skill in evaluating magnaflux indications.

The Magnaflux Test

Applied to high speed steel tools

Vincent O. Stromberg

Metallurgical Engineer
John Bath & Co., Worcester, Mass.

"It became apparent that magnaflux was able to reveal more than actual discontinuities in the steel"

THE Magaflux machine affords a convenient and effective means of inspection for mechanical defects in steels. For this reason, this apparatus has been found to be useful in the inspection of quality of material used in tools. Since it is non-destructive, tool users as well as tool manufacturers have adopted it for this purpose.

However, the skill as well as value of this inspection is more or less dependent upon the interpretation of Magnaflux results.

In Figure 1, for instance, is shown a tap which has been magnafluxed. In the bottom of the flutes of the tap can be seen lines which have been brought into view by magnafluxing and which might be interpreted as cracks. But, investigation of this tool (which was made of high speed steel) showed that magnafluxing can reveal lines of carbide segregation as well as actual cracks.

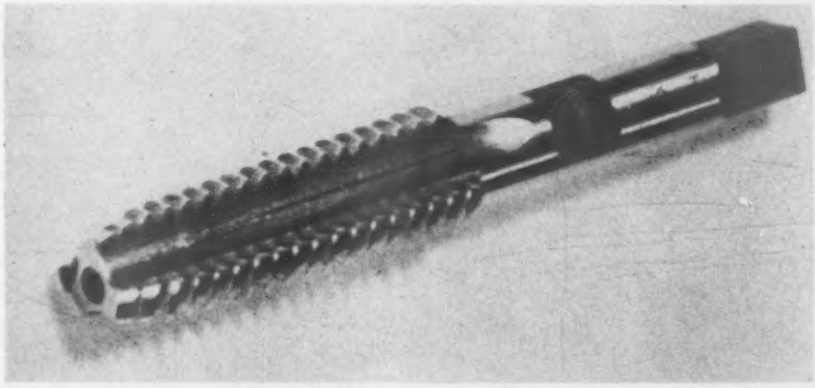


Fig. 1—A tap which has been magnafluxed. In the bottom of the flutes can be seen lines which have been brought into view by magnafluxing, and which might be interpreted as cracks. But, investigation of this tool, which was made of high speed steel, showed that magnafluxing can reveal lines of carbide segregation as well as actual cracks. Most high speed steel shows these lines.

To begin, it must be realized that high speed steel is highly segregated. This carbide segregate which was formed by the various alloys present in the steel was brought about in the original selective freezing of the metal when it was cast into an ingot. This selective freezing, resulted in having portions of the original ingot with carbide segregate concentrations in certain portions of the ingot. Later, when this ingot had been formed into lengthy bars, it would be seen, of course, that these highly segregated

areas were stretched out into definite lines along the bar. These lines of carbide segregate are more commonly called "stringers".

Stringers differ in chemical content from the steel which surrounds them. For one thing the carbon content is higher. When a piece of such material is hardened, these segregated areas will differ structurally and physically from the surrounding areas. Further, the magnetic properties will also differ.

In nearly every case of magnafluxing of hardened high speed steel taps, lines similar to those of Figure 1 were evident. Naturally then it has become necessary to carry out an investigation in order to determine what these lines could be. Such tests as examination of the surface of the steel at 250 magnification, acid etching and analysis of microstructures enabled one to offer a possible explanation.

In Figure 2 is shown the microstructure at 250X of the longitudinal section of a hardened and ground high speed steel tap blank. Carbide stringers are evident.

The whole polished surface of this specimen was examined this way until assurance was felt that there were no actual cracks present. Then the specimen was magnafluxed. Upon applying the Magnaflux compound by the immersion method it was readily seen that the compound elected to adhere along these lines of segregate. After using this method of investigation on several specimens, it became apparent that the Magnaflux was able to reveal more than actual discontinuities in the steel. In Figure 3 is shown the specimen which was magnafluxed after a microscopic examination.

It must be understood that the writer does not wish to infer that cracks are not found in stringers because this is not true in some cases. However, the possibilities of having cracks of this kind are dependent upon the degree of concentration of the carbides in the stringers and heat treating temperatures. For instance, if the carbon content is too great in these banded areas, it is possible to greatly overheat the structure in the stringers because the critical temperature of the steel in that area has been lowered. The surrounding structure may be normal. This can result in high stress concentration in a localized spot which would cause cracking along the stringer when the steel is cooled.

If a condition similar to this is present in a tool, the tool is defective. Therefore it is apparent that inspection of these stringers in steel is very important since they offer planes (or lines) of weakness in the steel. However any inspection of the steel when carried out in the annealed condition reacts differently to Magnaflux than when in the hardened condition. Therefore this particular test should be carried out when the steel is hardened in order to view the stringers by magnaflux inspection.

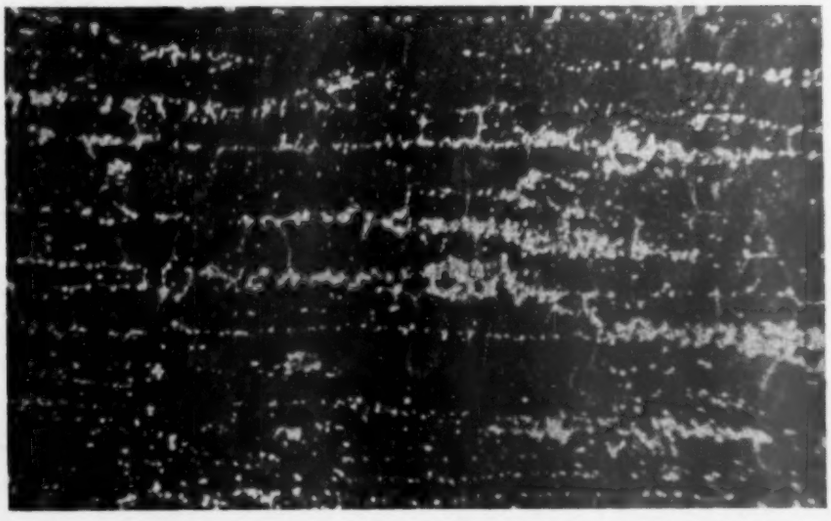


Fig. 2—Microstructure at 250X of the longitudinal section of a hardened and ground high speed steel tap blank. Carbide stringers are evident. The whole polished surface of this specimen was examined until assurance was felt that no actual cracks were present. Upon applying the Magnaflux compound by immersion, it was readily seen that the compound elected to adhere along these lines of segregate.

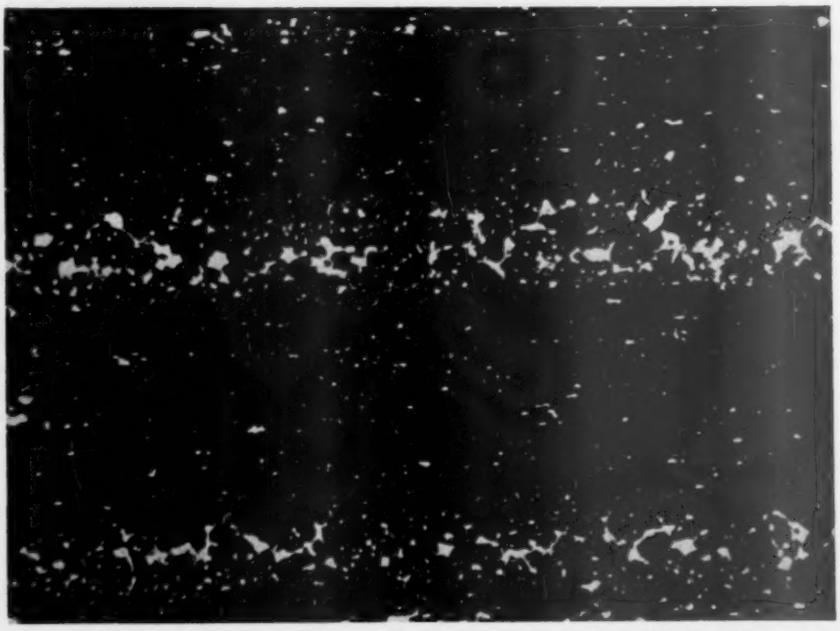
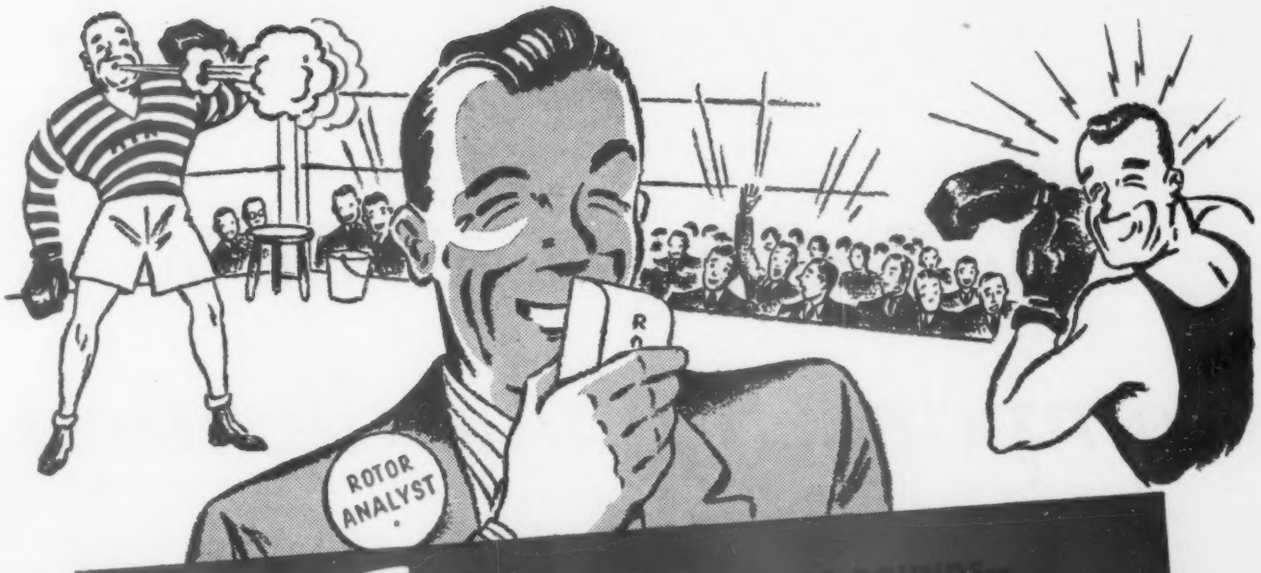


Fig. 3.—Another high speed steel tap blank, showing microstructure at 200X. This specimen was Magnafluxed after a microscopic examination, and again carbide stringer formation is detected. Carbide stringers may be indications of planes of weakness.



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The Tool Engineer's Job in

Company Standardization☆

John Gaillard

Mechanical Engineer
American Standards Association

The problems facing the Tool Engineer in setting-up standards in his company are many. John Gaillard tells what they are and how they may be solved successfully.

THE Tool Engineer has a twofold interest in the standards adopted by his company. To begin with, the standards set for the company's *product* affect him because he has to "design" its manufacture. Also, in planning the *production layout*, the Tool Engineer benefits by having at his disposal standards for all elements that regularly occur in such a scheme. Examples are the American Standards developed by the ASA Committee on Small Tools and Machine Tool Elements. Conversely, since the Tool Engineer is interested in his company's standards, he has a job to do in their development.

Controversies based on different views about company standards may arise in several places. For example, in many companies there is continuous friction between the engineering department and the workshop in regard to the problem of manufacturing tolerances. The designer usually has a tendency to be "on the close side". Unconsciously he may feel that this makes for a higher grade of work. The workshop, however, which has to stay within the tolerances, wants to have them as wide as possible. And if, moreover, the limits of accuracy to which a shop can work are not given sufficient attention by the designer, there will be a lot of trouble—with the Inspection Department also coming in as an interested party.

Two Sets of Tolerances

I had a curious experience with such a situation some years ago when making a survey of tolerance systems used in various branches of industry. One company manufacturing a production machine sent me a blueprint and a typewritten list, each giving a series of standard fits used by this firm. However, the tolerances on the blueprint were closer than those on the typewritten list. When I inquired about this discrepancy, the company answered that the blueprint gave the tolerances specified by the engineering department, while the typewritten list had been made up by the work shop because they knew they could not work to the blueprint. Actually, such a situation exists in many plants but in this case it had become a matter of record and had been informally sanctioned.

Differences of opinion about company standards may also arise between two groups of designers—the designers of the product, headed by the chief draftsman or chief engineer, and the Tool Engineers responsible for providing the manufacturing facilities. This situation is comparable to that concerning manufacturing tolerances.

The designer of the product is inclined to feel that since he is doing creative work, he should have considerable leeway in selecting dimensions, materials, component parts, etc. For this very reason, he is not particularly intent on keeping down, say, the variety of component parts used in the manufacture of a line of products.

Restriction in Variety

The Tool Engineer usually has a keener eye for possible restriction in variety because the manufacture of two or more different parts of the same kind, where a single part would suffice, means additional tooling and hence, higher cost. Also, the designer of the product sometimes neglects certain features of a component that have a direct influence on the facility

☆Abstract of talk given before the Philadelphia Chapter of the A.S.T.E., February 5, 1942.

of manufacturing it. If a piece is difficult or impossible to machine, it will have to be re-designed before going into production and such a correction may involve considerable loss in time, material, and labor—not to speak of loss of temper in several places in the company, which is also an important factor.

Now, why do such troubles arise? Simply because, while standards are needed, everybody follows his own ideas in developing them. The result is a lack of coordination between standards for the same subject set up by different groups or departments. If this is true, the remedy is obvious: create a central agency whose specific job it is to bring about that coordination of standards required by different groups in the company.

To take care of *all* of the standards required by a company, from mechanical standards to, say, standards for the selection of salesmen, would be too difficult a problem to concentrate in a single agency. Therefore, let us consider here, as being of direct interest to the Tool Engineer, the problem of coordinating the company's technical standards.

This can be done effectively by an Engineering Standards Committee appointed by the executive management. In many cases it has to consist of only five men—the chief engineer, Tool Engineer, production manager, chief inspector, and purchasing agent, who can render valuable advice on whether a material or component is available in the market. The Standards Committee may, and often should, call in others for consultation, such as the sales manager, the safety engineer or the personnel manager. In some cases it may be desirable to make these men permanent members of the Standards Committee. This depends on the way in which standardization work in a company is organized and this, again, must be decided with a view to the nature of its product, market, volume of business, and possibly several other considerations.

Hand-Tooled Job

No hard-and-fast rule can be set up for the organization of company standardization work. It must be a hand-tooled job which requires expert judgment and experience if it is to be successful.

The members of the Standards Committee are too busy with the work in their own departments to have time for collecting and digesting data for the formulation of company standards. For this job the Committee should have a secretary who develops into the standards engineer of the company. He is responsible for getting information of interest to the establishment of a company standard and may have to collect data not only within the company, but also on the outside, for example, from the American Standards Association, trade association and technical societies. In some companies, he may even have to get data about foreign or international standards.

John Gaillard
"Standardization is the key to co-ordination in company activities."

Digesting data and drafting proposed company standards requires a lot of time and work. Therefore, the standards engineer soon will need help. Starting with a stenographer and a draftsman, he thus may gradually build up a Standards Department.

The Standards Committee is the "legislative body" in regard to company standards. Its members will meet regularly—for example, once a week—to review proposals submitted by the Standards Engineer. When finally approved, these proposals go on record as company standards which have the force of law, within the organization. Their revision should be achieved by the same procedure as used in setting up standards.

To make company standardization successful, it is indispensable that it get full support from executive management. More than that: because the coordination of standards needed in different branches of the company work is an executive function *par excellence*, top management should take the initiative in organizing a Standards Committee.

Impartial Report

The standards engineer, while being secretary to the Standards Committee, should report to a high executive such as the president or a vice-president, but not to one of the department heads who are members of the Standards Committee. Otherwise, the Standards Department is likely to be influenced by the trend of thought in this man's department. For example, where manufacturing tolerances are concerned, the Standards Department, if reporting to the chief engineer, probably would be inclined to be on the "close" side and, if reporting to the Tool Engineer, on the "wide" side.

Another reason why the standards engineer should report to a top executive, is that he needs sufficient authority to collect effectively and speedily the necessary data from the other departments. It is often beneficial when the company standardization work is in course of development, only if a top executive is chairman of the Standards Committee. Even though he may not attend meetings where details are being discussed, this arrangement will show the whole organization clearly that the executive management is "sold" on the standardization work.

A Standards Committee uses the collective talent available.

The great advantage of having a Standards Committee is that the maximum benefit is obtained from the collective talent available in the company and that agreement on controversial matters is reached *before* dissension arises. This directly benefits the company's technical work and also saves an incredible amount of high-priced executive time. There are much fewer cases where the executive has to read letters, memoranda and reports in order to straighten out things as an arbitrator.

Company standards, thus set up by common agreement, have a far better

chance of being willingly introduced and maintained because they have been formulated by cooperative effort. True, a member of the Standards Committee may be overruled in a committee decision, yet he will feel that the standard decided upon should be observed because it is based on the consensus of his own committee. This consideration is even more important, as a psychological factor, than the circumstance that standards are made compulsory by the executive management.

Industrial Standards—and Speed

. . . Industry set up standards of perfection, established interchangeability and demanded a precision that completely revolutionized gaging and inspection . . . With high quality was combined speed of manufacture . . . We've just got to have both, but the latter can be sacrificed to a demand for quality . . .

We cannot successfully contend against an intensively prepared enemy if we set up standards which can only be attained at a sacrifice of essential speed.

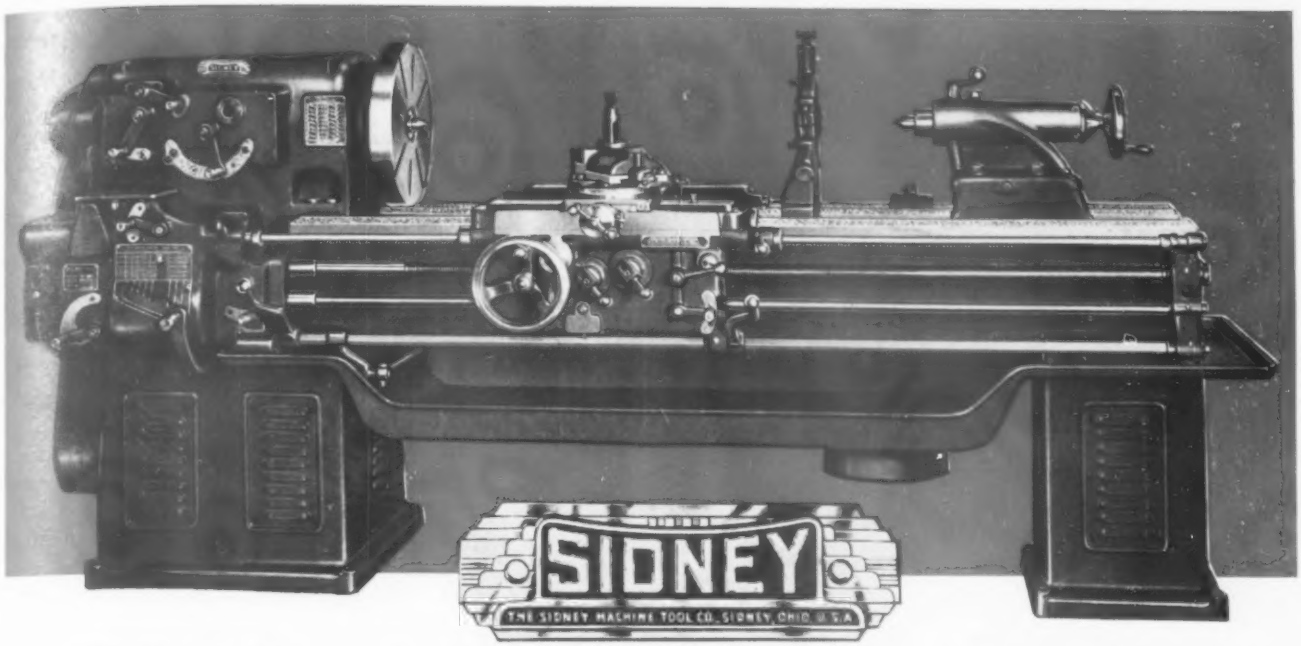
Coming back now to the Engineering Standards Department in a company, how is this going to give the best service? Industrial standardization is performed in four main stages with all of which the standards engineer may have to keep in touch. These are standardization work (1) in his own company, (2) in trade associations and technical societies; (3) on a national scale; and (4) on an international scale.

To do the best job for his company, this is a good general rule for the standards engineer to follow: First, check for an American Standard on the subject concerned. If there is none, see if a standard has been set up by a trade association or a technical society. If not, there may be available a standard set up by another company that has found wide recognition in practice and it may be well to adopt it. Sometimes, a suitable standard may be found in a different industry. Years ago a Swedish boat engine builder adopted in his design as many standard parts of the Ford car engine as possible, to facilitate servicing.

If no suitable standard can be found anywhere, the company will have to develop its own.

An industrial standard carries more weight if widely adopted.

The preference of choice recommended above is based on the fact that an industrial standard carries more weight the more widely it has been adopted by the groups interested in it. American Standards, that is, standards approved by the American Standards Association are backed by a favorable consensus of opinion of the entire national industry.



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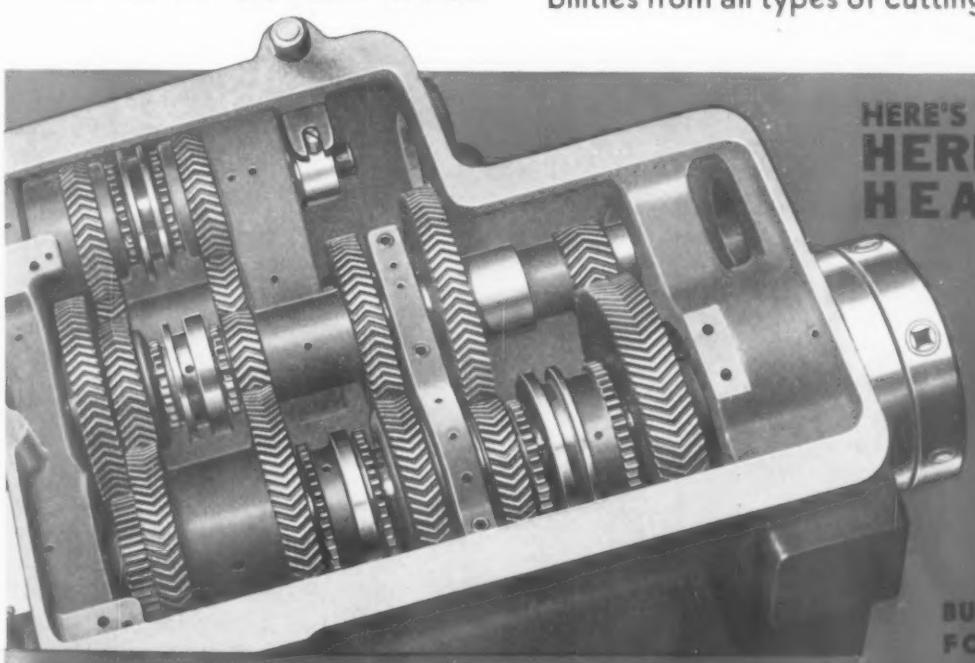

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Since the A.S.T.E. is a member-body of the ASA and there are quite a number of American Standards that Tool Engineers can use with great benefit in their work, the history of the ASA will be reviewed here briefly.

During the first World War, when mass production had to be stepped up, there was a chaotic condition in industry in regard to standards. To mention one example, there was no generally recognized standard for screw threads and so it happened that fuses made by one manufacturer could not be screwed into the noses of shells made by another because the two firms had been working to different standards.

In order to remedy this situation, the four large engineering societies of the mechanical, civil, electrical and mining engineers, and the American Society for Testing Materials, in 1918 founded the American Standards Association (then called the American Engineering Standards Committee) to function as the national coordinating body for industrial standardization work. From this membership of five societies the ASA has grown to an organization with a membership of close to 80 national organizations—mostly trade associations and technical societies.

The ASA is a member of the International Standards Association, a federation of more than twenty national standardizing bodies. The ISA, which has its headquarters in Basle, Switzerland, was founded in New York in 1926. When the present war started, there were about fifty international projects on its books. Since present world conditions make general international cooperation impossible, the ISA work has been suspended for the duration.

About two years ago the A.S.T.E. became a member-body of the ASA. Your Society is now represented on the ASA's Standards Council (the body that gives final approval to American Standards), the Mechanical Standards Committee, and 10 ASA committees dealing with technical projects. The A.S.T.E. representative on the Standards Council and the Mechanical Standards Committee is E. W. Ernest (General Electric Company), chairman of the A.S.T.E. National Standards Committee.

The A.S.T.E. is represented on the following ASA projects: Screw Threads; Cylindrical Fits; Small Tools and Machine Tool Elements; Gears; Code for Pressure Piping; Wire and Sheet Metal Gages; Stock Sizes, Shapes and Lengths for Iron & Steel Bars, Including Flats, Squares, Rounds & Other Shapes; Machine Pins; Surface Qualities; and Materials for Tools, Fixtures, and Gages. An abstract of 68 American Standards in the mechanical field and a few others that may also be of interest to Tool Engineers, was published in the December 1941 issue of INDUSTRIAL STANDARDIZATION, the monthly magazine of the ASA. (Copies of this issue are available.)

Tool Engineers will be particularly interested in the latest addition to the ASA's mechanical projects: Materials for Tools, Fixtures, and Gages. This was initiated upon request of the A.S.T.E. which asked that something be done to reduce the variety of tool steels now on the market under all kinds of trade names. Also it is the intention of the committee to put the specification of tool materials on a

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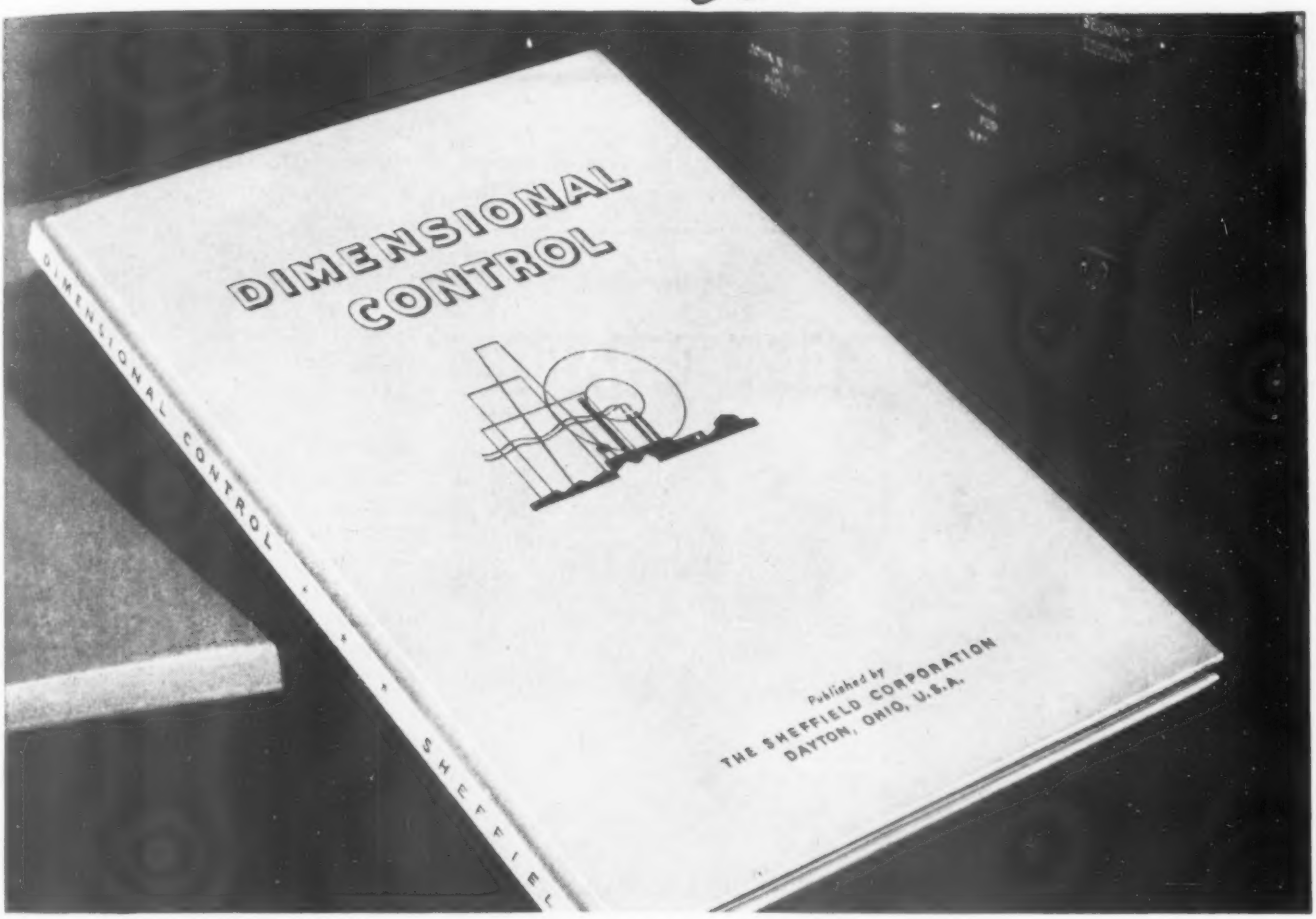

"Dimensional Control" is a new basic text on gages and their use in industrial inspection. It has been written for Engineering students, members of Defense Training Courses, and men in Industry who want a more complete knowledge of this phase of their work.

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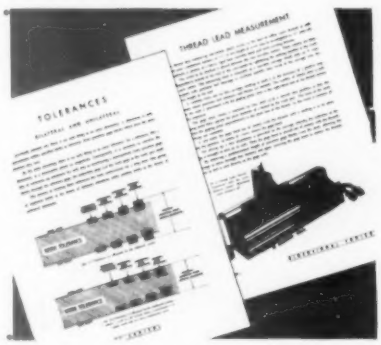

factual basis, so that the user will not have to rely solely on the claims made for each brand by its manufacturer.

The Tool Engineer often has to deal with the problem of laying out a series of standard values—such as dimensions, capacities or ratings—covering a given range of requirements. A valuable tool in tackling such a job is the American Standard for Preferred Numbers (Z1.1-1935). The origin of Preferred Numbers goes back to the eighteen-seventies when the French Colonel Renard was placed in charge of a section of captive balloons. He found that there was a variety of 425 cables to moor them, a number which struck him as being excessive. In studying the problem how to reduce it, Colonel Renard came upon the values now called Preferred Numbers, which the French still call the Series of Renard. The number of balloon cables was reduced from 425 to 17.

The American Standard recommends several series of Preferred Numbers each of which divides the range 10 to 100 into a number of steps (5, 10, 20, 40, or 80). The idea is that these values be used in preference to others unless there is a good reason for deviating from them. In each series, two consecutive numbers have the same ratio or, in other words, each number in a series is larger than the preceding number by a constant percentage. Thus, in the range from 10 to 100, the so-called 5-series contains the following values: 10, 16, 25, 40, 63, 100. Here, each number is about 60 percent larger than the preceding one. The Preferred Numbers also have a 10-series, a 20-series, a 40-series, and an 80-series, with step-ups of about 25, 12, 6 and 3 percent, respectively. One of these may have to be used when the 5-series is too coarse.

Now, if for example a manufacturer of electric motors has the problem of designing a series of motors covering the range of horsepower ratings from 10 to 100 with six sizes (five steps), and he follows the Preferred Numbers, he will automatically adopt the ratings 10, 16, 25, 40, 63 and 100 hp. If the manufacturer had nothing to go by, he might decide, for example, on the series: 10, 20, 30, 50, 75 and 100 hp.

But another manufacturer facing the same problem and equally without definite guidance might decide on the series: 10, 15, 25, 40, 70 and 100 hp. In the course of time, due to competition and with some customers changing from one manufacturer to another, each of the two manufacturers would probably make all of the existing ratings. Such a situation means an economic loss to both manufacturers as well as to their customers.

Now, if in establishing their ratings, they had followed Preferred Numbers, they would have hit at once, automatically and independently, on the same series and thus prepared the ground for later standardization. There are numerous cases in practice where Preferred Numbers may be easily applied, with great advantage. I should like to recommend that the Tool Engineer give them a chance in solving his problems.

The Tool Engineer in a company may find out about the existence of the American Standard Preferred Numbers, or any other American Standard that may be of interest to him, merely by chance. He may read about them or find out that one of his

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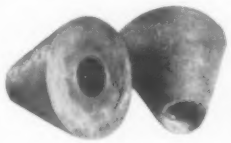
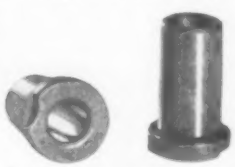


Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."



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colleagues is using them with advantage. However, if his company has a Standards Department, which collects this kind of information all the time as part of its regular duties and keeps in close touch with the work of the ASA, such standards will automatically come to the attention of those interested, like the Tool Engineer.

Clearly, then, the Tool Engineer will find great benefit in the existence of a Standards Committee and a Standards Department. If his company has none, it will be worth an effort to get them organized. You can safely make a recommendation to this effect to your executive management, without being suspected of trying to press your own viewpoint in regard to company standards.

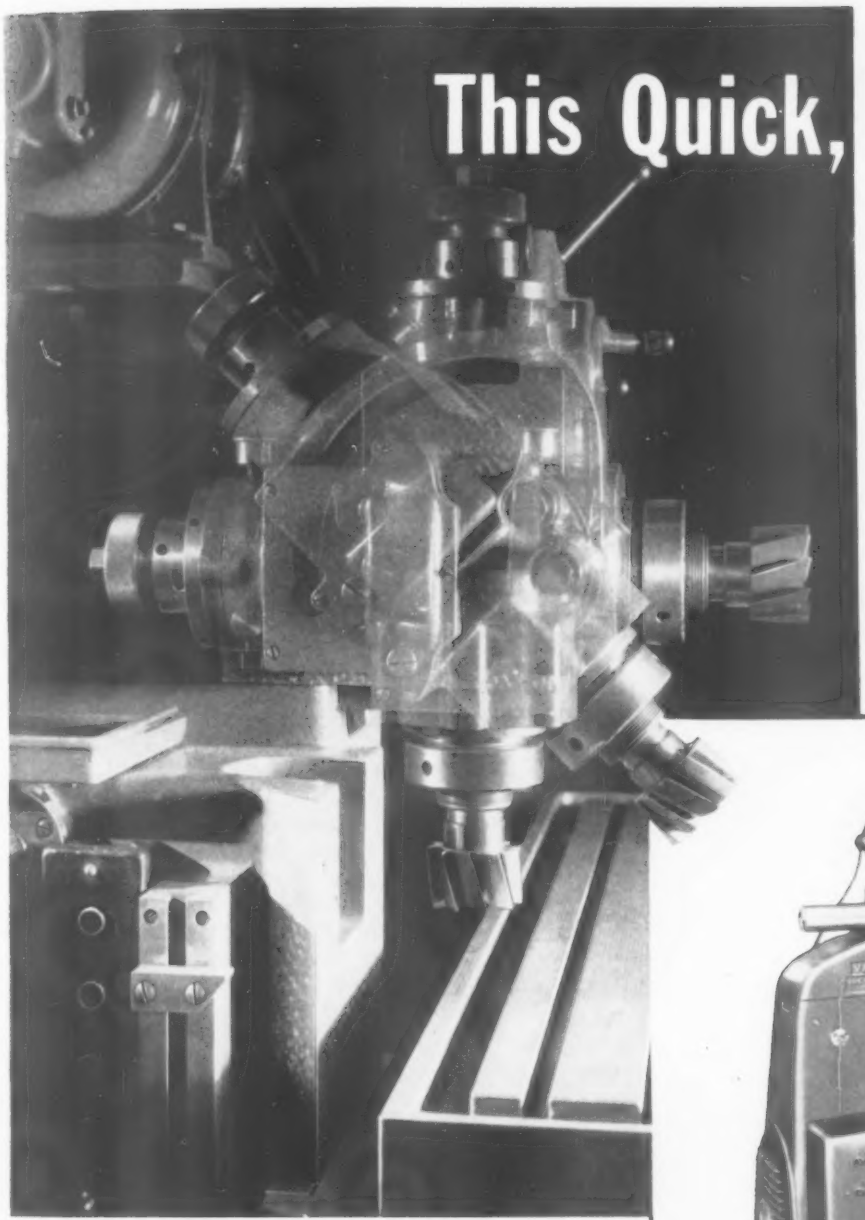
The way to harmonious cooperation proposed here is based simply on the American principle of democratic government — getting the different parties around the table to discuss their common problems and accept a decision based on the consensus of opinion. He who advocates the organization of company standardization work proposes the application of a sound philosophy to industrial practice, for the benefit of all.

The January, 1942, issue of THE TOOL ENGINEER contains a report by the chairman of the A.S.T.E. Committee on Education, Herbert D. Hall, entitled "Proposed College Course for Tool Engineers". This interesting proposal, which appears to be the result of considerable thought and discussion, gives a detailed list of the courses and the hours to be spent on them, for each of the four years. However, it contains no reference to standardization considered as the "key to coordination" of company activities. The only mention of standardization made in the report is in connection with time and motion study. This certainly is a most important factor in the planning of industrial work, but I believe that the student's attention should also be called to the advantages to the Tool Engineer of technical standards in general and the value of the systematic organization of standardization work in a company.

Therefore, the committee of your Society may still wish to consider the addition of a course on the principles and application of industrial standardization to the proposed program. This would be quite valuable to the Tool Engineer when he enters the practical field.

Whatever efforts Tool Engineers may make to promote company standardization, individually or through the A.S.T.E., the ASA will be glad to cooperate. The problem is urgent. War production calls for countless standards NOW if our national efforts are to be duly coordinated. Integration of these efforts starts with the individual company — the elementary unit in the national production machine.

The sooner every company "tools up for standardization", the more smoothly things will run—not only technically, but also from the viewpoint of organization. But war production is not all. We must not only win the war, but upon victory, also help organize the peace. Rebuilding a badly battered world and establishing satisfactory economic relations between countries will be a gigantic task in which standards established by national and international cooperation will play a major part.



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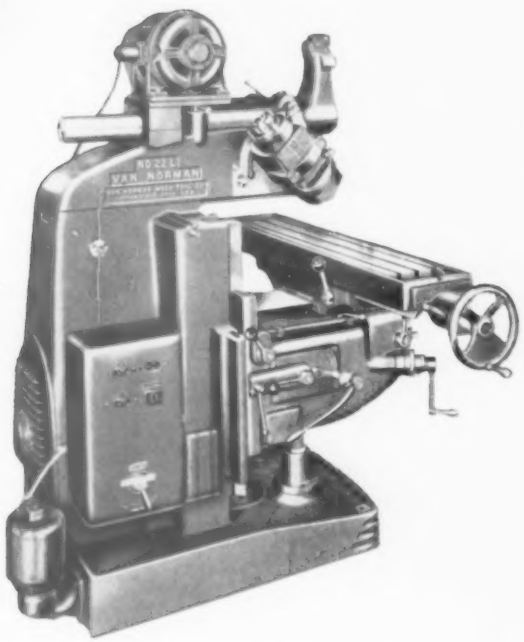
is an exclusive feature of all VAN NORMAN Universal Millers



NO. 22-L PLAIN & UNIVERSAL
Table: 45" x 10" Range: 28" longitudinal
10" cross, 16" vertical

This adjustable cutterhead eliminates delays commonly inherent in milling operations. For this head can easily get around the original set-up and mill it at any angle from horizontal to vertical, from either side, through the full run of the table. Any number of successive cuts may be taken, simply by positioning the head and sliding the ram in or out, which gains extra cross-range. This unmatched adaptability speeds the rate and safeguards the accuracy of output. And operation is made easier and more convenient by central grouping of the levers for directional controls of power feeds (also for 6-way rapid traverse) at both front and rear of machine. Van Norman Universal Millers see many jobs through from start to finish, without attachments, and without transferring the work to other machines.

Van Norman Machine Tool Company

SPRINGFIELD, MASS., U. S. A.

Handy Andy Says—

HAD news from one of our Juniors the other day — Steve Magyar, the name is — now somewhere "over there" along with a few more of our boys. The last I saw him, Steve was a 2nd Looey, and, presumably, still climbing, for, like the typical Tool Engineer, he came up the hard way. Shortly after induction he was initiated into the K.P., which, as you know, isn't short for Knights of Pythias in Army language. It happened this way: His captain, a martinet of the old school, was reviewing his company one gray morn, and somehow didn't like the way the rookies did their right abouts. He dressed 'em down in words of one syllable, then, perhaps correctly interpreting Steve's look, singled him out. "What's the matter, soldier? Haven't you ever heard a he-man cuss before?" "He-man?" Steve looked him over. "Listen, mister. I worked with a chief inspector back home, and that guy could spot you ten words to the minute and out-cuss you to the tape". Whereupon Steve was assigned to kitchen ordnance. But, you can't hold a good man down; in turn, he became first class private, corporal, sergeant, earned his commission. Okay, Steve, give 'em hell but come home with your shield; we'll need you after the war.

▼ ▼ ▼

Got quite a kick out of "Greenie", the frill who has lately crashed the pages of the TOOL ENGINEER. And why not?—there'll be plenty of *femmes* in our war plants from now on, taking the places of the boys who are called to man the tools the stay-at-homes produce. And personally, I'm in nowise allergic to women in the shops, nor, for that matter, in the drafting rooms. A number of women have won renown in the engineering field, which isn't so odd considering the number of men who have excelled as cooks and dress designers. (How'd you like to be a corset fitter, or vulcanize a girdle on some form divine?) Anyway, women apply themselves intensively to their work and, as a rule, are a steadying rather than a disturbing influence. But when they go on a rampage! — well, then they prove the late Rudy Kipling's contention that "the female of the species is deadlier than the male." At that, Greenie will no doubt develop into a good shopman(?) once the lace curtains have gathered a bit of grime. Or shall we turn her over to Prof. Boston and have him make a Tool Engineer out of her? But here's to you, Greenie!—keep 'em laughing.

▼ ▼ ▼

In my account of the Convention, published in previous issue, I mentioned a kidnapping in which Otto Winter and Yrs. Truly were the not so unwilling victims. But that's all forgiven, only, next time any of you boys pull me into an all night session give me a chance to first fill a quart thermos with my favorite brand of coffee. Now, however, I want to bring out a few matters discussed at that rump session, and be it known to all concerned that the boys from down yander had something to say and said it exceedingly well. One thing brought out was that members in the remote fringes feel neglected; their Chapters are taken into the Society and then, apparently, left to their own devices. Speaking from my own experience — and I've been fairly active in this outfit—I can say that neglect of even the least of the Chapters, numerically speaking, or of a member at large, is entirely contrary to A.S.T.E. policy. We

must consider, however, that the past year has seen an unusual expansion of the Society, and that the exigencies of war have tended to disrupt the ordinary routine of things. Men just can't get away like they used to; they're needed on the job.

▲ ▲ ▲

A considerable proportion of our speakers have been, and still are, sales engineers for the larger corporations, and while their talks may be promotional they are also, as a rule, interesting and of considerable import to Tool Engineers. But, a Chapter may be beyond their range of travel, or a tour may be interrupted by a hurry call to the home office, especially at a time like this. In view of conditions, it is a good plan to draw on home talent, and members may be pleasantly surprised, oftener than not, by a talk given by some local dark horse. Then, too, there are other subjects besides Tool Engineering, and local or nearby colleges may be glad to send an authority on economics or social trends. It's all educational. However, I think that steps will be taken to improve this condition, and certainly the men delegated to attend the Conventions bring home rather reassuring pictures of the lively interest shown by the Society in its new and remote Chapters. After all, we are sttill suffering from growing pains, and many of us have poignant memories of what the parent group went through in the early days. Anyway, don't worry; you may be remote, but you're not forgotten. And remember this:—that "they also serve who only stand and wait." You are members of the most progressive engineering society in the world, one which, in an hour of grave national emergency, can contribute and does contribute materially toward preserving that freedom for which millions of our boys, the cream of American manhood, are now prepared to make the ultimate sacrifice. Largely, the future of America rests on our inventive genius and mechanical ingenuity, on our knowledge and experience in solving the problems of mass production. Be privileged to bear with us in a period of abrupt transition.

▼ ▼ ▼

Another thing discussed was our publication, THE TOOL ENGINEER — which, incidentally, you are reading at this moment and, perhaps, with considerable interest. Naturally, there was some criticism, but then, what publication isn't criticised? At that, I think that the Tool Engineer will compare favorably with the best, and I've noticed, on numerous occasions, that copies laying around in offices here and there are generally dog eared from use. Personally, I think that the critics are critical because it's *their* magazine; they want it to top the field and they're jealous if it falls short of an ideal. All right, then, you do your share to make it better, always remembering that it caters to an exclusive field and that there's room in this land of ours for all of the technical magazines published. Even then, all of them together can't begin to publish all of the knowledge accrued from years of development of methods, machines and tools, nor begin to scratch the surface as far as present trends are concerned.

▼ ▼ ▼

For one thing, every Chapter can contribute to general reader interest besides stimulating local interest. Personally, I scan the Chapter doings to see if Bill Ormondroyd of Taft-Peirce has joined up or if John Sundkvist in Hartford has become a grandpop, and

(Continued on page 180)

Don't Gamble— with Your Cutting Tools

Grind Safely with NORTON WHEELS

WAR time is no time to take chances with hard-to-replace cutting tools. The stakes are too important NOW—cutting tools must be sharpened carefully and correctly for two important reasons: 1. so each tool will deliver maximum life, 2. so each tool will perform at maximum efficiency on its machine. You can't afford to take chances with your grinding wheels or your grinding methods.

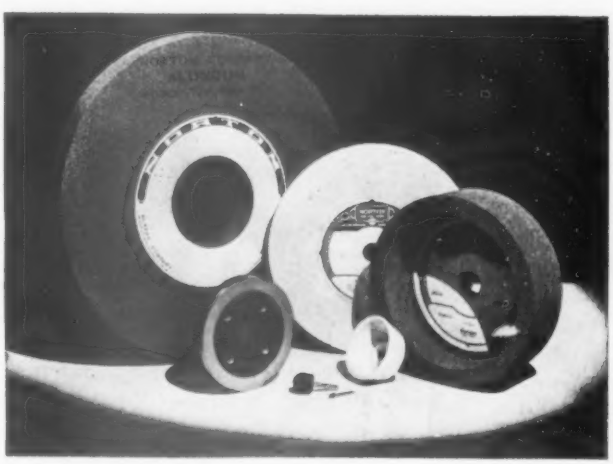
When you specify Norton Tool Wheels you know you are eliminating the gamble. You are getting wheels developed by Norton research especially for tool room service. You are getting wheels made by skilled Norton workmen using the most modern manufacturing facilities. And Norton engineers will be glad to help you select the proper wheels for your particular tool room jobs—"B-E" bond Alundum wheels for high speed steels and Stellite, Crystolon vitrified wheels and two types of diamond wheels for the cemented carbides.

"A Handbook on Tool Room Grinding" — 177 pages of helpful information on wheel selection and use. Write for a copy mentioning Tool Engineer.

●

NORTON COMPANY
Worcester, Mass.

Distributors in All Principal Cities



W-860

NORTON ABRASIVES

A. S. T. E. DOINGS . . . . . .

Binghamton

The Binghamton Chapter held its regular meeting on April first at the Link Aviation Devices Cafeteria at Hillcrest, N. Y. The meeting was opened at 8.30 P.M. by Chairman Kishbaugh who offered a tribute to the late Bill Forde. The Committee chairmen were announced as follows: Jasper W. Mazar —Meetings and Arrangements, Joseph F. Ahearn—Industrial Relations, Fred S. Euerle — Entertainment, J. Donald Ahearn — Standards, Lynn L. Hallock —Publicity, Fred W. Heidtman—Constitution and By-Laws, A. A. Zurbruegg — Membership, and Ed P. Burger — Editorial. The notice of a joint meeting on April 17th of the Southern Tier Engineering and Technical Societies was announced.

The 120 members and guests then heard Mr. A. H. Moore, Electronic control specialist of the New York office of the General Electric Company, who spoke on "Electronic Controls as Applied to Machine Tools." Mr. Moore explained the uses of Thy-mo-trol and Photo-electric tubes. A demonstration unit having "Thy-mo-trol" control was used and offered excellent control of motor speeds and loads. The meeting was adjourned at 11:30 P.M.

Boston

The April 16th meeting of the Boston Chapter was held at the Hotel Lenox. Nearly one hundred members and guests attended. Gadget talks were given by C. H. McVey of Scott & Williams, Inc., who explained the design and use of trunion jigs and L. S. Gates of R. S. Wilder, Inc., who showed the mechanism of a chucking plug for holding thin sectioned tubular castings. Highlight of the evening was a movie of former Chapter 33 outings by Bill Young our former secretary and present chairman of the membership committee.

Principal speaker was Mr. Herman F. Zorn of The V. & O. Press Co., Inc., Hudson, N. Y. Mr. Zorn's talk, illustrated with slides, was on the subject of "Presses Geared For Defense."

Buffalo

The April 6th meeting of the Buffalo-Niagara Frontier Chapter, was held at the University Club and was a meeting of the Chapter Executive Committee. Those in attendance were the incoming officers and committee chairmen, outgoing officers and past Chapter chairmen. After the introduction of the incoming officers and chairmen, a short business meeting and general discussion was held.

After serving for two years as national editorial chairman and as editor of this column, Irwin F. Holland has retired from his editorial duties. His excellent work and cooperation in interpreting the doings of fellow Tool Engineers are greatly appreciated.

Louisville received its charter on the night of March 24. Pictured above are the new chapter officers with past president, Frank Curtis and Ray Morris, 1st vice-president.

Chicago

The Chicago Chapter held its regular monthly dinner meeting on April 6th at the Midwest Athletic Club. The officers for the new year were installed by retiring chairman S. G. Goransson. They are: Roy R. Hoefer, Chairman; Frank Martindell, Vice Chairman; Fred J. Schmitt, Secretary; and Harold M. Taylor, Treasurer.

After the brief business session, Mr. H. M. Downing, of the Lincoln Electric Company, Cleveland, Ohio, showed slides and gave a talk entitled "Lower Tooling Costs with Arc Welding, Jigs and Fixtures."

The short talk which prefaced the showing of the slide film was a discussion of welding as it pertains to various metals, the welding of metals of similar physical characteristics, also those of dis-similar characteristics, and the general results to be expected.

The slide film was roughly divided into three parts, the first part being a series of rather simple jigs and fixtures for machine work such as drill jigs, milling machine fixtures, and fixtures

Boring Time Cut in Half

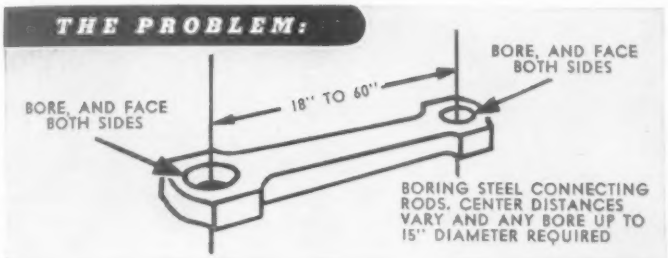
on Diesel Engine Connecting Rods

Simple Special Machine Doubles Production in Less than Half of Previous Floor Space . . . . . .

The two main bores of these Diesel engine connecting rods were formerly machined in two hours floor to floor. With this machine the time has been reduced to less than one hour per rod. Since the rods varied in size, a special machine had to contain adjustments for various center distances and bore sizes.

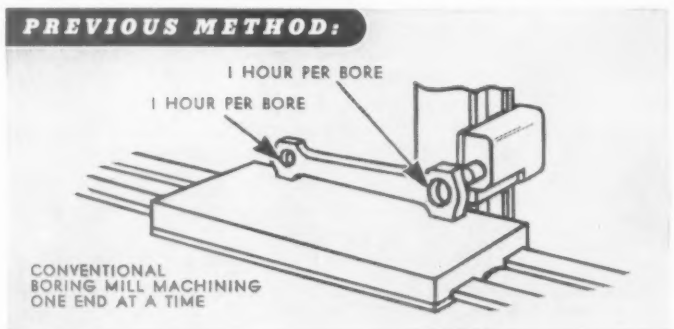
This is an excellent example of how production can be doubled without faster cutting, and without twice as many machines. Here's the story in brief:

THE PROBLEM:



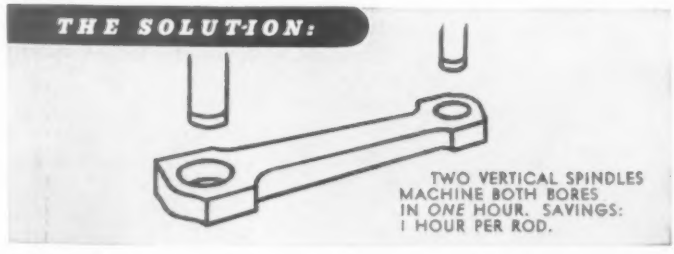
The rods are drop-forged high-carbon steel — center distances vary from 18" to 60". Two boring cuts, and facing of both sides is required on each end — stock to be removed varies up to ¾" on the side.

PREVIOUS METHOD:

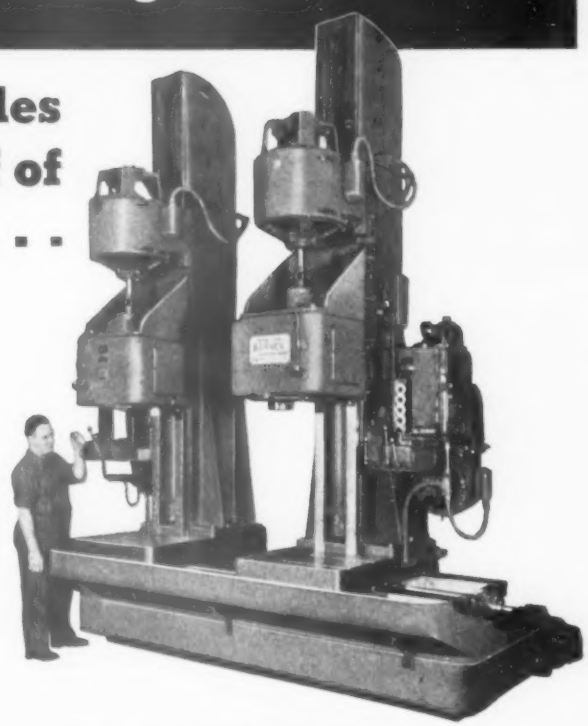


In using a conventional boring mill, only one hole could be bored at a time. After boring and facing one, additional time was lost in indexing table and gauging second bore. The production rate of two hours, on a rod of 36" center distance, was achieved only through proper tooling and fixture set-up on the boring mill. The bore sizes are 8" and 5½".

THE SOLUTION:



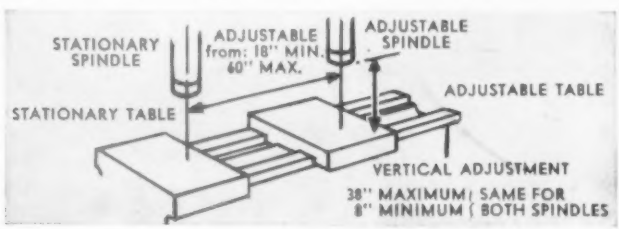
By providing a simple two spindle vertical machine, both rod bores can be machined simultaneously. The vertical position of spindles facilitates chip removal, while adjustment to one spindle accommodates rods of various lengths.



THE MACHINE

Sufficient adjustment is provided in this machine to accommodate various sizes of connecting rods. Each boring head is actuated individually by hydraulic feed and traverse units mounted on the column.

ADJUSTMENTS provided are shown below. Two tables mounted on the same bed are utilized. The left-hand head, column, and table are stationary. The right-hand unit is arranged for lateral adjustment.



More Production and Tooling Ideas FREE

Not a catalog, but a set of eight bulletins describing a better way to get better machines. Each bulletin traces a machining problem from the original study of the part to the final machine design. Each may suggest a more productive tooling set-up that you can use today—valuable file information for tomorrow. Write for bulletins: T. E. 3P

W. F. & JOHN BARNES
ROCKFORD ILLINOIS

for welding parts assemblies. In the second phase of the film the physical characteristics of steel versus cast iron was graphically illustrated by means of these slides. This indicated tensile test specimens, bend specimens, impact and fatigue. All this was rather clearly brought out by a series of films and the results in the finished product indicated.

The final phase of the film illustrated the repair and maintenance of existing fixtures and dies, and perhaps the outstanding part of this was the salvage value of existing tools that have become worn and lost their usefulness.

The second speaker of the evening was Mr. W. Boese, Welding Supervisor, Pullman Standard Car Manufacturing Company, Hammond, Indiana. He gave a talk on welding of jigs and fixtures on operations in connection with the Pullman Standard Car plant.

Cleveland

The Cleveland Chapter had its biggest meeting of the year on April 10th, with a turn out of over three hundred members and guests. C. V. Briner made an interesting report on the recent national convention in St. Louis. Chairman Charles W. Scheihing announced that the Cleveland Chapter had set a goal of two hundred new members this year.

Two special guests of the evening were L. O. Mellen, Assistant District Representative of the War Production Board, Training within Industry Division, and R. L. McFarland, Senior Administrative Assistant in the Personnel Division of the Cleveland Ordnance District.

McFarland's division is concerned with training, safety and labor. In a brief talk he emphasized that each one of us is in the Army now and that the job to be done is bigger than any of us realized. He pointed out that a year ago about eighty people constituted the total personnel of the Cleveland Ordnance District and that now over three thousand are employed.

Mr. Mellen asked the members of Cleveland's Chapter for help on this problem of the W.P.B.'s Training within the Industry Division. About 200 men with the experience and background of machine shop practice are needed in the Cleveland area as part time instructors. These instructors can be used part time after working hours and will be compensated.

The principal speaker of the evening, Roy E. Bender, Superintendent of Training of Thompson Products, Inc., talked on the subject, "Training for War Production." Bender outlined the training program used and developed at Thompson Products. The Thompson plant employs four different methods of shaping, namely, fluid (die casting), plastic (forging), cutting (lathe work), and grinding.

After his talk Mr. Bender presented the new Thompson movie entitled "Streamlined" depicting the real life drama in the skies, on land and on sea in both war time and peace time. It contained actual war pictures showing our armed forces in action and an interesting trip through the Thompson plant.

Columbus

The Columbus Chapter held its monthly dinner meeting at the Hotel Fort Hayes on the night of April 9th. The business session was called to order at 8:00 P.M. by the newly elected chairman, Mr. Stanley Mack. A sound motion picture, "Uses and Abuses of Twist Drills," was shown. Following this movie Mr. Thomas Thomas of the Cleveland Twist Drill Company, spoke of several interesting experiences he had encountered in various industries relative to

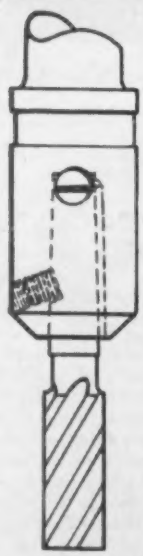
MIDWEST

THESE HIGH PRODUCTION TOOLS OFFER THE POSSIBILITY OF INCREASING YOUR PRODUCTION

Midwest End Mills are made with a high helix angle (fast spiral) to provide maximum speed in action, and with plenty of chip room to prevent clogging of chips in the flutes.

The Midwest Taper and Pin Drive tool holder has a round pin partially imbedded in the wall. A corresponding keyway in the tapered shank of the end mill fits this pin. As a result full driving energy is exerted along the entire length of the end mill shank. A safety lock screw holds the shank firmly in place. The drive is positive, rigid and always perfectly aligned.

These features in Midwest Pin Drive End Mills permit higher speeds and feeds; they result in greater production, more accurate work and exceptionally high finishes in milling operations.



ASSEMBLY VIEW
showing Midwest Pin Drive
with safety lock screw

BUY U.S. DEFENSE SAVINGS BONDS AND STAMPS

MIDWEST

Precision METAL CUTTING TOOLS

END MILLS • SLEEVES
• COUNTERBORES •
SPECIAL TOOLS • DRILLS
REAMERS • FORM TOOLS
CARBIDE TIPPED TOOLS
ADJUSTABLE HOLDERS

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drills and drilling problems.

Open discussion, from the floor, was then called for and many questions were answered and various drilling problems were discussed at length with recommendations being made by the speaker.

Detroit Student Chapter

The technical session of the Detroit Student Chapter was held on March 25th. A lecture was given by Mr. Jas. R. Longwell, Factory Manager of the Carboloy Company on "The Manufacture, Design and Use of Cemented Carbide Tools." The lecture was followed by a demonstration in the laboratory. The following officers were elected on April 10th: Arthur D'louhy, Chairman; Mathew Wittman, 1st Vice Chairman; Malcolm Reith, 2nd Vice Chairman; Fred Schaltenbrand, Secretary; and Harold DeVreugd, Treasurer.

Elmira

The annual installation of officers of the Elmira Chapter took place the evening of April 9th in the Tom Sawyer room of the Mark Twain Hotel. Mr. Conway D. Thomas, retiring chairman, inducted the new officers as follows: Mr. M. Hugh Evans, Chairman; Mr. Dolph Kyler, first Vice Chairman; Mr. George N. Morceau, Secretary. Unable to attend the meeting were Mr. Ellis P. Oldham, Second Vice Chairman and Mr. Ivan M. Gowdy, Treasurer.

Seventy members attended the dinner which preceded the installation of officers.

The speaker of the evening was Mr. Frank O. Hoagland, Master Mechanic of the Pratt & Whitney Co., West Hartford, Conn. His main theme was jig boring and its attendant problems.

Fond du Lac

On April 10th, members of the Fond du Lac Chapter drove to The Valley Inn, Neenah, Wisconsin, on the west side of Lake Winnebago, to hold their April dinner meeting.

This was an open meeting with The Engineers' Club of the Kimberly-Clark Corporation. Also, because of the nature of the evening's discussion, directors of the Vocational Schools and plant officials throughout the Fox River Valley were invited to attend.

112 members and guests attended this meeting and listened to the topic "Training within Industry, Job Instruction Training, and Subcontracting", presented by Mr. George F. Havlista, Director of Industrial Training, Kearney & Trecker Corporation, Milwaukee, Wisconsin.

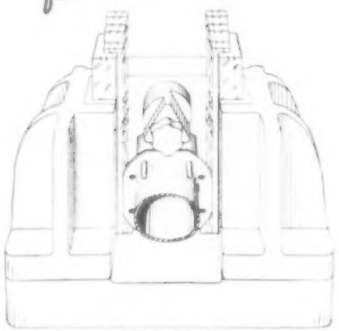
Mr. Eugene Bouton, A.S.T.E. regional director, and Chief Engineer of War Production Board, Milwaukee, presented a report of the St. Louis meeting, and also announced that Milwaukee was selected for the 1943 March meeting.

Western Michigan (Grand Rapids)

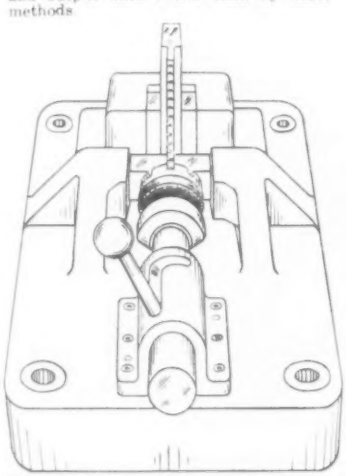
The April 13th dinner meeting of the Western Michigan Chapter held at the Columbia Hotel, Kalamazoo, Michigan, was attended by 126 Tool Engineers. This was the first meeting the society has held in the city of Kalamazoo.

After a brief business meeting, the meeting was then turned over to Mr. Hoogerhyde, program chairman who welcomed and introduced Mr. H. E. Linsley of the Wright Aeronautical Corporation of Paterson, New Jersey. Mr. Linsley gave a short description of the sound film to be shown. It was entirely about the Tool Engineering of the Wright Whirlwind and Cyclone motors for aircraft. This film showed the father of all machine tools which was built especially for the various machine operations on cylinder blocks.

at Continental Motors for example . . .



Three passes of the broaches on a Colonial Senior press, and the flats on the cylinder flange of a radial engine are finished. The cam above the cylinder in the fixture controls the infeed for each pass. Precision and output both better than by other methods.



Castellating nuts used to be a milling job. Here is a broaching setup that answered the demand for greater accuracy in special nuts. The output also turned out to be much greater than if the nuts were milled individually. It's another three-pass job to complete, and a Colonial Senior press is used.

R & F slotting of counterweights on a single Colonial Universal Horizontal in five operations with four broaches. A typical job-lot production setup. The two counterweights give an idea of the metal removal required.

AMONG OTHER COLONIAL JOBS AT CONTINENTAL:

Broaching fuel pump drive gear. Broaching splines in generator gear, oil pump drive gear, scavenger pump gear, oil strainer nipple, generator drive gear support, etc. Broaching keyway in tachometer drive shaft gear. Burnishing such parts as vacuum pump adapter bushing, etc., etc.

In Broaching you get both . . .

Some machines are bought for the accuracy to which they can machine, some for rapidity of metal removal. The reason there is such a demand for broaching machines and broaches today is that in broaching you get BOTH.

For job lots as well as mass production —in a multitude of operations—broaching has definitely established itself as the fastest and most economical method of removing just the right amount of stock in just the right places. One Colonial standard broaching machine, for instance, will frequently equal the daily output of several machines of another type to do the same job, even though broaching may have been adopted to meet more stringent accuracy requirements.

May we suggest that you start today to look over your present and projected production setup to determine how many machines you can eliminate from your requirements by broaching?

Scheduling your future broaching machine requirements now will help to insure getting them when you need them. There is a Colonial representative in your territory who will be glad to help you.

We will be glad also to put you on the mailing list to receive "Broaching News" monthly. In it you will find varied examples of how broaching may be used to lower costs, increase production, and improve accuracy. A note on your company letterhead suffices.

COLONIAL BROACH CO.

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Hartford

The April meeting of the Hartford Chapter consisted of a dinner at the City Club, followed by a Technical Session at the Gas Company Auditorium at 8.00.

The Technical Session was preceded by the installation of Chapter officers. Frank Curtis swore in Harry Hauck as Chairman, Carl W. Moeller, first Vice-Chairman; Henry A. Rockwell, second Vice-Chairman; Clayton S. Parsons, Secretary; and Edmond Morancey Treasurer.

The topic of the evening was "The Machineability of Metals" and was covered by A. H. d'Arcambal, Vice Pres. and Consulting Metallurgist for Pratt & Whitney, Div., Niles-Bement-Pond Company. The speaker, introduced by John J. Curry, of New Departure Division of General Motors in Meriden, pointed out many interesting features of the newer steels and their increased machineability.

Louisville

The newest A.S.T.E. Chapter, No. 54, received a Charter on the night of March 24th at the Brown Hotel in Louisville. Frank W. Curtis and Ray H. Morris made the presentation.

Following short talks by Mr. Curtis and Mr. Morris, Mr. James Weaver Past President of the A.S.T.E. talked to the members of the new Chapter.

Elected as officers were: Kenneth C. Jasper, Chairman; Frederick Brown, First Vice-Chairman; Fred W. Fieldhouse, Second Vice-Chairman; John H. Thomas, Treasurer; and Sauter F. Reichert, Secretary.

Milwaukee

The April 9th meeting of the Milwaukee Chapter was held in the Colonial Room of the Republican Hotel.

Mr. H. L. Heywood, Retiring Chairman, introduced the newly elected officers: Mr. Julius Riedl, Chairman; Mr. William Iekel, Vice-Chairman; Mr. Roland N. Navertz, Treasurer; and Mr. Paul O. Wernicke, Secretary.

After the introduction of the new officers Mr. Riedl took over the meeting, on behalf of the Chapter, and presented a watch to the retiring Chairman, Mr. Heywood.

The technical part of the session started out with a moving picture made by the International Harvester Company showing how shells are made.

After the movie Mr. Clifford Ives of the WPB spoke to the gathering. After Mr. Ives' talk Mr. Bouton gave a report of the proceedings taken at the St. Louis Meeting and told the members that Milwaukee was granted the next conven-

tion of the A.S.T.E. in March 1943.

Twin City (Minneapolis-St. Paul)

The Twin City Chapter met on a Wednesday evening, April 22nd, at the Midway Club, St. Paul. This meeting was primarily for the installation of new officers.

Officers installed were: Francis E. Gruber, Chairman; Wm. E. Boker, First Vice-Chairman; A. A. Havir, Second Vice-Chairman; and Lyle E. Overholt, Secy. and Treasurer. Entertainment for the evening was furnished by Dr. George M. Robertson.

Pictured above are members of the official committee for a Buffalo Chapter dance. Seated, left to right, are C. W. Crofoot and A. C. Siegel. Standing, left to right, are F. M. Wilson and A. F. Kirchgessner.

Montreal

The April 8th meeting of the Montreal Chapter was held in the Windsor Station in Montreal.

Executives of the Chapter were introduced as follows: John Hall, Chairman; Jim Davis, First Vice-Chairman; R. B. Douglas, Second Vice-Chairman; H. E. Gibson, Secretary; and E. Kingsland, Treasurer.

Mr. Hall introduced the guest speaker who was Mr. F. Schytte, of the Canada Illinois Tool, and Vice-Chairman of the Toronto Chapter. Present also, were Len Singer, Secretary of the Toronto Chapter, and E. Barker, past Chairman of the Toronto Chapter.

The subject of the evening's educational talk, was "Broaching in War Industries," ably presented with lantern slides by Mr. Schytte. Charts for figuring angle, rake, pitch and chip clearance of broaches were also shown.

The many questions asked after the talk brought out information on relative efficiency of hydraulic versus lead screw drive broaches, and information on widely divergent classes of broaching. Many were surprised to learn that the hydraulic was the more positive type of broaching machine.

Peoria

The Peoria Chapter's April meeting was attended by ninety-six members and guests. The installation of the new officers followed the dinner.

A lecture was given by Malcolm F. Judkins, Chief Engineer of the Firthite Division of the Firth Sterling Steel Company. He explained briefly how tungsten carbide is manufactured, and the methods employed in brazing the

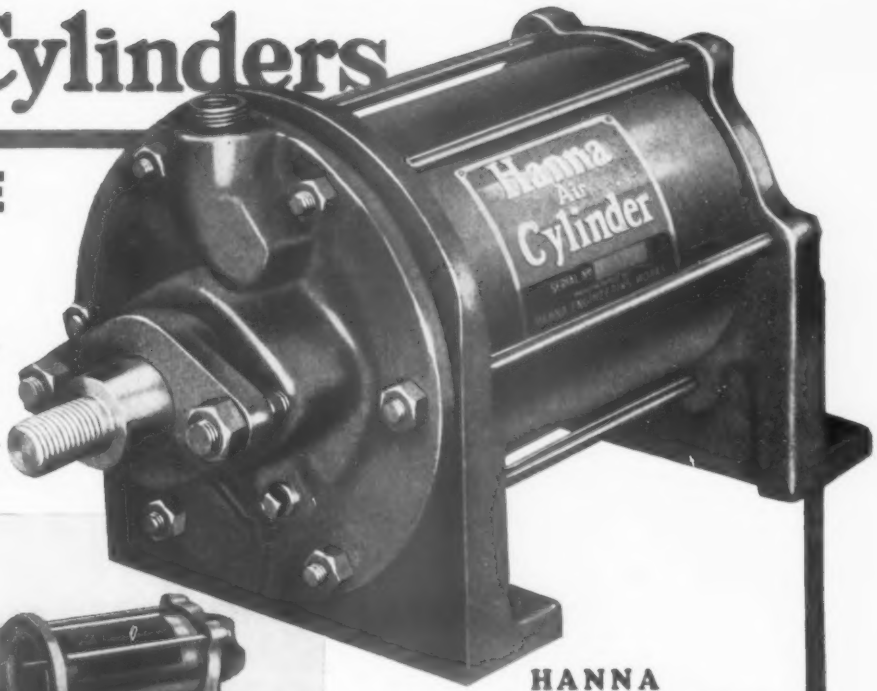
Hanna Cylinders

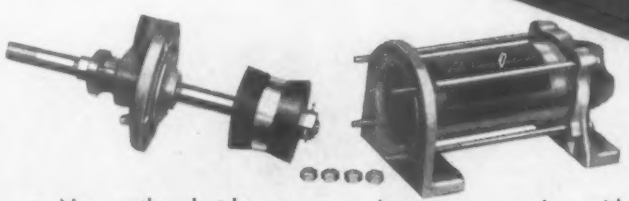
DEPENDABLE

Power

TO PUSH, PULL, OR LIFT...

on 1001 Jobs





• No costly shutdowns or maintenance worries with simple, sturdy Hanna Cylinders. Nothing wears but packings that are quickly replaced. The unique strain rod and flange construction permits piston removal without complete dismantling. Four nuts come off — that's all!

HANNA ENGINEERING WORKS

1765 ELSTON AVE., CHICAGO, ILL.

Air and Hydraulic

CYLINDERS • RIVETERS

VALVES • HOISTS

ARTER ROTARY SURFACE GRINDERS finish swivel blocks for Reed-Prentice lathes absolutely flat and parallel. On this job, in common with other parts of the Reed-Prentice lathe there must be a high degree of precision .... one of many surface grinding jobs that pass over these machines in this plant.

Arter engineering for surface grinding jobs is at your service.

ARTER GRINDING MACHINE COMPANY

WORCESTER, MASSACHUSETTS • U. S. A.

ARTER

tips to the steel shanks, his description being augmented by movies. He explained that many setups employing tungsten carbide tools are run too slow, resulting in a loss of cutting tool efficiency.

Movies depicting life in the army were presented by the United States Army Recruiting Office.

Rochester

The Strong Auditorium of the University of Rochester was the scene of the April 8th meeting of the Rochester Chapter.

The speaker of the evening was Mr. Elya, representative of The Norton Company. His talk was followed by a motion picture on grinding wheels and grinding procedure. A discussion period followed.

Rockford

The April 9th meeting of the Rockford Chapter was held at the Hotel Faust in Rockford. The installation of Chapter officers for 1942-43 was conducted by Mr. G. C. Johnson, W. F. & John Barnes Company, and a past Chapter Chairman. The new officers installed were: Mr. Fred Kampmeier, Chairman; Mr. Leo Reuland, 1st Vice-Chairman; Mr. Roy E. Dreyer, 2nd Vice-Chairman; Mr. Fred Swanson, 3rd Vice-Chairman; Mr. Walter Lustig, Treasurer; and Mr. Ernest Norrman, Secretary.

Variance At Elmira

Joe Menihan (left), retiring secretary of the Elmira Chapter and Con. Thomas, retiring chairman, make the tall and short of it.

The after dinner speaker was Mr. S. M. Roberts, Chief Engineer, Contract Distribution, Bureau of Field Operations, War Production Board, Chicago. His subject was Industrial Conversion from Peace to War of manufacturing companies not engaged in war materials.

St. Louis

The St. Louis Chapter held its monthly meeting on the night of April 9th, at the Hotel Melbourne.

Vice-Chairman, Ernst Nieman, introduced the guest speaker, Mr. A. B. Segur of the Segur Company, Chicago, who spoke on Time and Motion Analyses. For the first time in the Chapter's history, several women from St. Louis war industries attended the technical discussion.

THE REED POLICY

of PLANT EXPANSION
INCREASED PRODUCTION
SIMPLIFICATION OF MODELS

IS AIDING US TO DELIVER MICROMETERS

to plants that can furnish preference ratings and to mechanics who can fill in our simple form, proving that they are working for defense.

In order to meet the tremendous demand among thousands of mechanics for micrometers, the REED factory is temporarily devoting its entire production to the following four models.

ONE INCH MICROMETERS

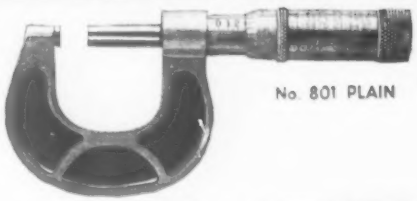
No. 801 plain	List $ 6.25
No. 901 plain with 1/10.000" vernier	List $10.25

TWO INCH MICROMETERS

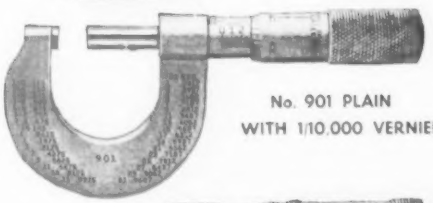
No. 802 plain	List $ 7.00
No. 802 plain with 1/10.000" vernier	List $ 8.75

SEND IN YOUR ORDER OR WRITE FOR FOLDER

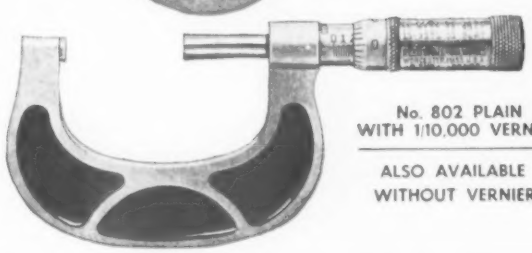
GEORGE SCHERR COMPANY, INC.
132 Lafayette Street New York, N. Y.



No. 801 PLAIN



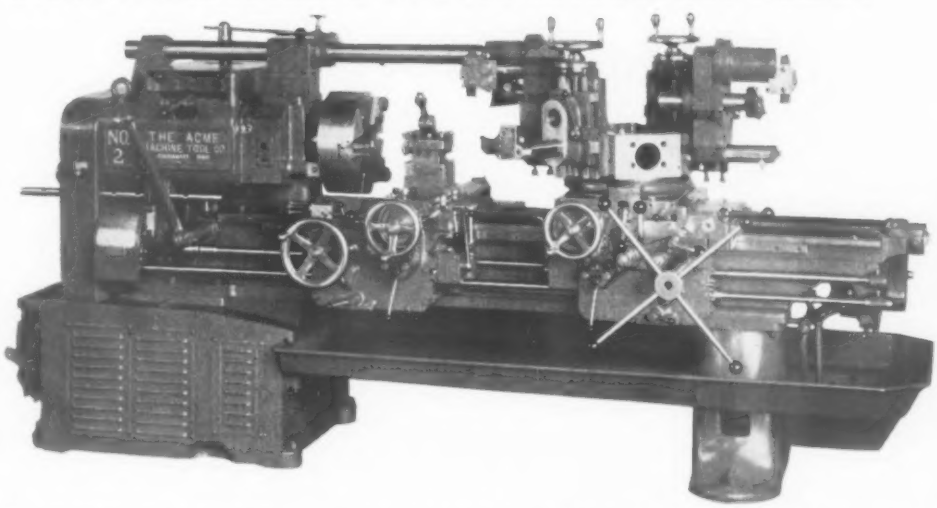
No. 901 PLAIN
WITH 1/10.000 VERNIER



No. 802 PLAIN
WITH 1/10.000 VERNIER

ALSO AVAILABLE
WITHOUT VERNIER

RIGIDITY and ACCURACY
UNDER HEAVIER CUTS AT FASTER SPEEDS!



No. 2 Universal Turret Lathe with stationary overhead pilot bar and headstock brackets. Heavy duty multiple turning heads and vertical side tools and heavy duty reversible cutter holders. Also shown is the lead screw type chasing attachment with split nut brackets and threading dials on both carriages.

This machine with its stationary overhead pilot bar and headstock brackets together with rigid turret tooling permits heavy multiple cuts. Thus accuracy is assured, while faster speeds are possible through the use of cemented carbide cutting tools.

WRITE FOR COMPLETE DETAILS

THE ACME MACHINE TOOL COMPANY
CINCINNATI, OHIO

San Diego

The San Diego Chapter held its meeting March 29th at the El Cortez Hotel in San Diego.

The meeting was brought to order by Mr. Floyd Cox, 1st Vice-Chairman, in the absence of Mr. J. J. Tucker, Chairman, who was attending the convention in St. Louis.

Mr. Benjamin Cullen, instructor Machinist at North Island Naval Air Station, was one of the speakers at the meeting. Mr. Cullen gave an introductory talk regarding the life work of Dr. Roy Rife, speaker of the morning.

Above—San Diego Chapter members pose for a picture. In the group are several Los Angeles A.S.T.E.'ers.

Dr. Rife gave a very interesting talk on the designing of microscopes and their various uses in science.

Golden Gate (San Francisco)

Seventy-five members and guests attended a dinner and meeting held at the Engineers' Club in San Francisco on the night of April 14th.

After the dinner new officers were introduced and installed. A sound picture was then shown which demonstrated the preparation and training in advance of an air raid.

Mr. Walter Kassebohm, the Chapter's new Chairman, then introduced the speaker of the evening, Mr. J. C. Fletcher, who gave a talk on surface finishing. Mr. Fletcher reviewed the progress that has been made in standardizing surface finish. Symbols used to indicate the finish and tolerance allowable, were illustrated by means of a chalk talk.

$10.00 had been offered to the person bringing in the best specimen of a mechanically finished surface. Member Harold Burlingame won the prize with a specimen averaging 4 micro inches in height and depth.

Schenectady

The Elks Club was the scene of the April 9th meeting of the Schenectady Chapter. Sixty members and guests were present to take part in the installation ceremonies of the newly elected officers. The new officers were: Chairman, H. Crump; First Vice-Chairman, J. L. Tocher; third Vice-Chairman, F. R. Linehan; and Treasurer, R. H. Wilke. C. E. Smart and N. Y. Coxe, Second Vice-Chairman and Secretary respectively, were absent.

Mr. Crump introduced Mr. A. Hanson, Sales Manager of the U. S. Tool Co. in the Schenectady District and

then Mr. W. P. Powers, Secretary of the U. S. Tool Co. who was the speaker of the evening.

Mr. Powers' talk was on Multi-Slide Presses and Millers. He explained in detail the general principles of operation of these machines, emphasizing the fact that the multiplicity of motions which are encountered in these machines are all produced by action of various types of cams. Mr. Powers' talk was illustrated with slides and motion pictures showing not only the operations of these tools but also the many types of parts which may be produced from them.

South Bend

The South Bend Chapter held its April 14th meeting at the Elkhart Hotel at Elkhart. Mr. Stanley R. Cope officiated, replacing Mr. H. R. Wentzell, the retiring chairman.

Rev. Paul S. Schumucker, who recently returned from the Interior of Borneo, by the way of Singapore and Cape Hope, spoke on the customs and living conditions of the people. Moving pictures taken by Rev. Schumucker, some of which were colored, illustrated his recent stay there.

Twin States (Springfield, Vt.)

The April 8th meeting of the Twin States Chapter was held at Masonic Temple at Springfield, Vermont. The meeting was called to order at 8:00 P.M. by Chairman Robert S. Gillette, after the regular dinner meeting.

Two news reels were shown, one showing some of the battles of France, and the other showing the Jap attack on Pearl Harbor.

Mr. Gillette then introduced the speaker of the evening, Mr. Howard Stagg of the Crucible Steel Company, who gave an illustrated talk on "Steel Failures". A brief discussion period followed.

Syracuse

The Syracuse Chapter met on Tuesday, April 14th, at the Onandaga Hotel for its monthly meeting. Attendance at the dinner was augmented by a large delegation from Oneida, Ltd., who came especially to learn about industrial training as the company has been compelled by the war to convert its manufacture to military items and must train a number of workers in new operations. Credit for acquainting the visitors with the Chapter in Syracuse should go in a large measure to past Chairman Bert Mitchel.

The New Chapter Chairman, Clayt Ainsley, introduced the guest speaker, Herbert D. Hall, President of the Herbert D. Hall Foundation of Newark, N. J. Mr. Hall spoke on "New Developments in Machine Shop Training Technique." He covered the courses of study being formulated at the present time to fill the demand for machine operators during the national emergency. The uses of slide films and motion picture films as a corollary to industrial training were illustrated with representative examples. Mr. Hall stated that such visual aids are being used in the defense training program.

Potomac Chapter (Washington, D. C.)

Eighty-five members and friends attended the April 2nd meeting of the Potomac Chapter which was held at the American Legion Club in Washington, D. C.

After a brief business session, Chairman, Mr. Raymond C. Harbst, introduced the principal speakers of the

evening. Mr. Frank W. Curtis, Past President of the Society, gave a short talk on the organization. Mr. F. J. Rawson, Secretary of the Potomac Chapter, gave a report on the Tenth Anniversary meeting in St. Louis. The business session wound up with a short talk by Mr. Robert H. Oakes, Chairman of the Standards Committee. Mr. Oakes spoke on the need of further standardization in the tool industry.

The principal speaker of the evening was Mr. Frank W. Curtis, Chief Engineer, Van Norman Machine Tool Company. Mr. Curtis spoke on the subject, "Tool and Fixture Design."

Williamsport

The Williamsport Chapter held its April 13th meeting at the Lycoming Hotel. Following dinner, the meeting was called to order by Ed. Greer, Chairman. Mr. Greer introduced Mr. Howard Stratton, a guest from Elmira, New York, who gave a report on the Business Session of the national meeting at St. Louis.

The meeting was then turned over to Mr. Ted MacLafferty, Eastern Manager of the Carboloy Co., Inc., who gave a blackboard lecture on the application, care, and grinding of carbide cutting tools. Mr. MacLafferty stressed the point that the manufacturers of carbide tools are putting forth every effort to standardize their tools.

Eighty-eight members were present at this April meeting.

Worcester

The Heald Machine Company was host to the members of the Worcester Chapter for their April 14th meeting. The members were taken on a tour throughout the new office building.

Dinner was served in the new air-conditioned cafeteria with Mr. Robert Lippard, Assistant Sales Manager of Heald Machine, chairman of arrangements. Among the visitors was Mr. William Brown, Works Manager of all the Wright Aeronautical plants who reviewed briefly the status of the airplane motor plant years ago and of today.

Mr. Leslie Goff, Worcester Chairman, turned the meeting over to Mr. Floyd Harris who in turn introduced Mr. Williams, the main speaker. Mr. Williams talked on the borematic and illustrated its capacity for doing various types of work with slides. 175 members were in attendance.

Western Ontario (Hamilton)

The April 9th meeting of the Hamilton Chapter was held at the Royal Connaught Hotel.

New Chapter officers were installed by chairman W. A. Dawson. They are: Charles A. Fisher, chairman; Joseph Little, 1st vice-chairman; Stephen J. Myers, 2nd vice-chairman; E. L. Greer, secretary; and H. C. Coit, treasurer.

The guest speaker of the evening was Mr. E. V. Flanders, manager of the thread grinding department, Thread Tool Division of the Jones and Lamson Machine Company. "Modern Developments in Thread Grinding" was the title of Mr. Flander's talk. Slides were used to illustrate his talk.

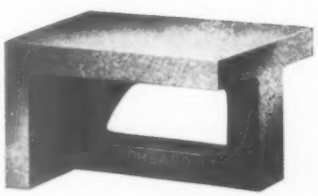
Later in the evening an outline of the convention at St. Louis was given by past chairman Dawson.

One of the most successful gatherings the Hamilton Chapter has ever had, this meeting attracted 132 members and guests for the dinner and 186 for the technical session.

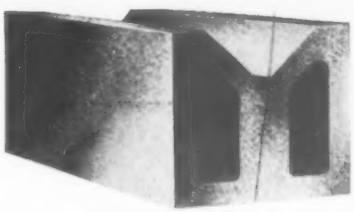
Scraped ANGLE PLATES · V BLOCKS

Lombard angle plates and V blocks are made of high grade close-grained semi-steel type iron, under rigidly supervised control given special heat treatment to relieve casting and machine stress, hand-scraped slowly, carefully, to produce a high degree of precision. Construction is extra rigid and heavy.

INSIDE ANGLE PLATES		
Stock No.	Size (inches)	Wt. per piece, lbs.
468-1A	4x4x6	10
468-2A	6x6x8	23
468-3A	8x8x8	41
468-4A	8x9x10	52
468-5A	10x10x10	75
468-6A	12x12x12	116
468-7A	18x18x18	260



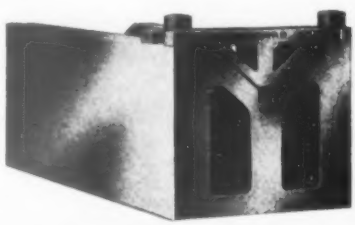
UNIVERSAL RIGHT ANGLE IRONS		
Stock No.	Size (inches)	Wt. per piece, lbs.
471-1A	3x4x6	7½
471-2A	4x6x8	15½
471-3A	6x8x12	30½
471-4A	8x10x18	58



V BLOCKS		
Stock No.	Size (inches)	Wt. per pair, lbs.
467-1A	3x2x5	12½
467-2A	4x3x6	25
467-3A	6x6x7	70
467-4A	8x6x8	108
467-5A	8x8x8	120

For holding circular pieces to be milled, ground, shaped, or for inspection work, Lombard hand-scraped V blocks are unexcelled. Sold in matched pairs of identical size. Clamps furnished with blocks as shown below hold securely, prevent slipping.

V BLOCKS with CLAMPS		
Stock No.	Size (inches)	Wt. per pair, lbs.
467-1C	3x2x5	14
467-2C	4x3x6	30
467-3C	6x6x7	80
467-4C	8x6x8	118
467-5C	8x8x8	135



WRITE FOR DETAILS AND PRICES . .

LOMBARD GOVERNOR CORPORATION
100 MAIN ST. ASHLAND, MASS. U. S. A.

(Continued from page 120)

ing certificate, or by any preference rating order of the P-series, except through Orders P-90 or P-100.

March 27—Amendment No. 1 to Supplementary Order M-21-d limits use of steel containing four percent or more of chromium to ratings of A-1-k or higher. Original order, issued December 27, 1941, permitted deliveries of four percent chrome steel on ratings of A-10 or higher.

March 27 — Announcement made of appointment of Charles T. Ripley, chief engineer of the technical board of the Wrought Steel Wheel Industry, of Chicago, as consultant on Diesel engine propulsion equipment in the section of Materials and Equipment of the Office of Defense Transportation.

March 28 — Amendment No. 2 and Extension No. 2 to General Preference Order M-17 makes pig iron subject to allocations. The amendment eliminates the reserve tonnage pool and, instead, places all pig produced under mandatory control. Purchasers of pig iron are required to fill out Form PD-69 and PD-70, showing inventory and consumption. Producers may ship pig only in accordance with schedules filed on Form PD-71, subject to approval by the Director of Industry Operations.

March 28—Inventory survey ordered of available industrial diamonds. Shortage for tool uses stimulated action. WPB hopes to discover supply not in use.

March 30—General Allocations Control Order covering nickel—M-6-a—extended for an indefinite period. Specific instructions for melting and processing may be given by the Director of Industry Operations.

April 1 — Preference Rating Order P-77, covering material for the rebuilding of machine tools, extended to May 1, 1942. The order applies only to companies to which an individual copy of the order has been addressed with a serial number. Companies operating under the order have been advised to shift over to operation under the Production Requirements Plan.

April 2—Report announced by WPB Tools Branch Chief George C. Brainard showed that the value of new machine tools, presses and other metal working equipment shipped during February was $93,100,000. Shipments of machine tools alone amounted to 20,307 units, with a total value of $84,355,000, a considerable increase over shipments during January.

April 3—Interpretation of P-7 (merchant ship construction rating order) provides that ratings under the order can only be applied to perishable tools, not to machine tools and other permanent tools.

April 6—Suppliers Inventory Limitation Order L-63 sharply limits suppliers inventory of foundry supplies, industrial supplies, transmission supplies, and welding and cutting supplies. These are among the 19 kinds of supplies affected by the order.

April 9—General Limitation Order L-83 prohibits manufacturers of industrial machinery from filling any orders for the production or delivery of stipulated types of new, second-hand, or reconditioned machinery without WPB approval. Army, Navy, certain other

Government agencies, United Nations governments, and Lend-Lease orders are excepted from the provisions of the order. Orders bearing a rating of A-9 or better issued on a PD-1, PD-1A, or P-19-h certificate may be filled, and orders carrying a rating based on a PD-3 or PD-3A certificate, countersigned before the effective date of the order (April 9), are permitted to be filled.

Exempted from provisions of the order is machinery involving a cost of less than $200, or in the case of the pulp and paper industry, units costing less than $1,000. These exceptions are for administrative purposes, so that WPB will not have to direct the distribution of small machinery units. Machinery covered by the restrictions follows: Leather working and tanning, cotton ginning and delinting, shoe manufacturing, and shoe repairing, (regardless of the cost of the machinery); packaging and labeling, pulp and paper making, paper converting, printing and publishing, bakery, confectionery, beverage bottling, industrial sewing.

April 10—Amendment 2 to M-43 restricts the sale of solder, tin-bearing babbitt with a tin content of 16 percent except by retailers, and except on rated business carrying an A-9 or higher, or on an A-10 when for repair of existing machinery, or for the manufacture of cans within the limitation of the can conservation order M-81. Amendment No. 2 to M-43-a removes limitations on use of tin for the manufacture of implements of war.

April 13—Amendment 3 to Preference Rating Order P-68 gives steel producers a higher rating on repair and maintenance needs. Thirty percent of the dollar volume of repair and maintenance allowed an A-1-c rating. A-3 applicable to remainder. A-1-a ratings on actual breakdown needs and A-1-c ratings on supplies needed to make reasonable advance provisions against breakdowns are continued.

April 13—Amendment 2 to Preference Rating Order P-56-a permits companies operating under mining machinery and equipment order to use the ratings on equipment required by South American copper companies operating under P-58, to iron and steel producers operating under P-68, and to smelters operating under P-73.

April 14—Filing date on industrial diamond report under Order M-109 postponed to April 30.

April 14 — Shipment of National Emergency Alloy Steels by mills to fabricators or laboratories for experiment or analysis are excluded from priorities controls.

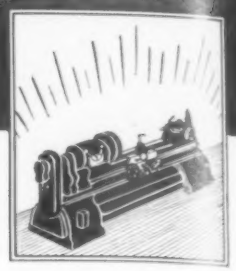
April 14—Manufacturers of mining machinery allowed an A-1-a rating on a percentage of their material requirements under Order P-56-a. (Action considered preliminary to placing mining equipment industry under Production Requirements Plan.)

April 17—Order L-100 places heavy compresses under allocations control system.

April 20 — Survey of metal uses launched. All metal users who receive report form PD-275 are required to fill them out and return to the Bureau of Census not later than May 15. Form is similar to that sent out on January 30.

April 21—Division of Industry Operations announced that effective immediately no individual application from a manufacturer for materials to be incorporated in his products over a period of more than one month will be approved. Measure is aimed at forcing industry to operate under the Production Requirements Plan.

NEW EQUIPMENT, Materials, Processing

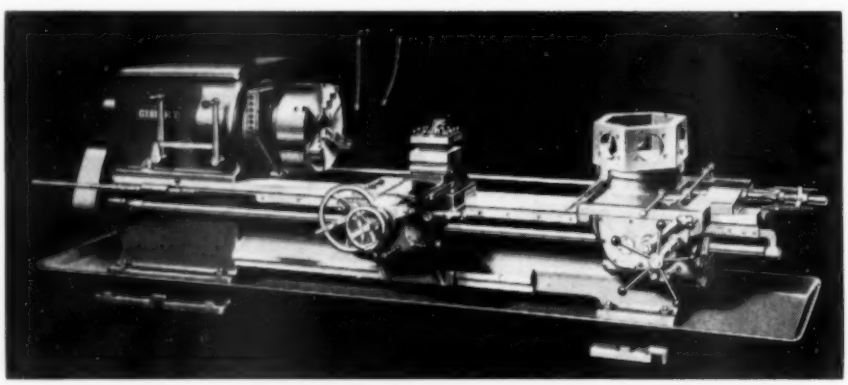


GISHOLT SADDLE TYPE TURRET LATHE (G59)

Built in two sizes of 28½ inch and 31 inch swing, 5¼ inch and 9¼ inch bore, two new saddle type turret lathes are being put into quantity production by the Gisholt Machine Company, 1229 East Washington Avenue, Madison, Wisconsin.

Known as the 3R and 4R, they are similar in many physical specifications to the 3L and 4L machines. However, in view of their design for large scale production, the machines must be built on readily available machine tools and from materials obtainable in the large quantities necessary. They will be provided with the most commonly used tools and attachments.

The 3R has 5¼ inch spindle bore, 21 inch chuck, 28½ inch swing over ways, 26 inch swing over carriage wing, and 21½ inch swing over cross slide. The 4R has a 9¼ inch spindle bore, 24 inch chuck, 31 inch swing over ways, 27½ inch swing over carriage wing, and 24½ inch swing over cross slide.

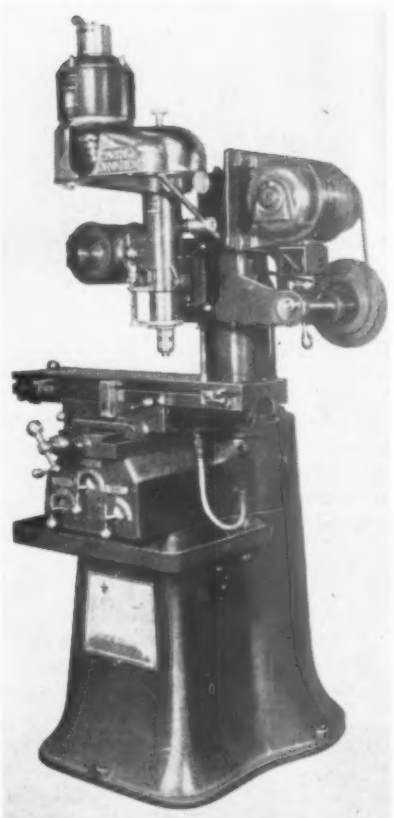


Gisholt Saddle Type Turret Lathe
Provided with the most commonly used tools and attachments.

ARMOR TURRET MILLING MACHINE (G60)

Utilizing a combination of a horizontal spindle and a vertical spindle capable of any angle, mounted on a single rigid turret which rotates a full 360 deg., the milling machine announced by the Aircraft Machinery Corporation, Burbank, California, is said to open up an entirely new field of uses in the tool room, pattern shop, and general production plants.

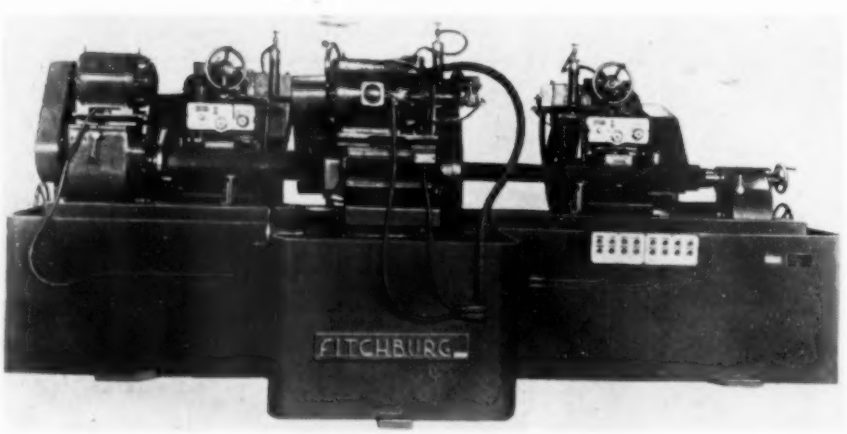
Other features claimed for the Armor Universal Turret Milling Machine include: vertical, angle and horizontal spindles with three low and three high spindle speeds, 16 inches of travel both vertically and longitudinally, and all tolerances held to less than one thousandth.



Armor Turret Milling Machine
Horizontal and vertical spindle.

FITCHBURG GRINDING MACHINES (G61)

Particularly adapted for spot grinding gun barrels and long spindles, this machine built by the Fitchburg Grinding Machine Corporation, Fitchburg, Mass., has standard Fitchburg bowgage independent, self-contained wheelhead units. Rough forgings, which have previously been centered, may be ground directly from the rough or from rolled stock. To allow spot grinding to be performed on a variety of gun barrels or spindles, the bowgage heads are mounted on ways so that they may be located longitudinally in different positions.



Fitchburg Grinding Machine
Adapted to spot grinding gun barrels and long spindles.

VERTI-HYDRA-MATIC CHUCKING MACHINE (G62)

A new type of single spindle, automatic chucking machine that has a vertical chuck, is hydraulically operated, and is fully automatic, has been introduced by the Production Machinery Development Company, 4845 St. Aubin Avenue, Detroit.

It has a rigid central column bear-

FREE INFORMATION and SERVICE

Request the information and service you desire and keep your library up-to-date . . .

THREE FREE SERVICES . . . WITHOUT OBLIGATION

For your convenience, these three business reply cards enable you to request quickly . . .

1 New catalogs—bulletins listed in this issue.

2 Additional information or bulletins relative to new equipment—new materials or new processes.

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●

HOW TO ORDER

Simply fill out the card, indicating the information or service you desire, and mail. Be sure to write, in the square, the identifying number of the catalogs or bulletins covering new products described. In answering an advertisement, include the name of the advertiser and indicate by a cross if literature is desired or if company representative should call. No stamp is required.

1

USE THIS CARD for requesting new catalogs and bulletins listed in this issue.

Write in square, number of item describing one catalog wanted ➡ ☐

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER, MAY 1942

Write in square, number of item describing one catalog wanted ➡ ☐

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER, MAY 1942

Write in square, number of item describing one catalog wanted ➡ ☐

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER, MAY 1942

Write in square, number of item describing one catalog wanted ➡ ☐

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER, MAY 1942

2

USE THIS CARD for requesting additional information or bulletins relative to new equipment, materials, processes, etc.

Write in square, number of item describing one catalog wanted ➡ ☐

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER, MAY 1942

Write in square, number of item describing one catalog wanted ➡ ☐

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER, MAY 1942

Write in square, number of item describing one catalog wanted ➡ ☐

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER, MAY 1942

Write in square, number of item describing one catalog wanted ➡ ☐

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER, MAY 1942

3

USE THIS CARD when answering advertisements, to obtain specific information on problems or when you desire a company representative to call.

NAME OF ADVERTISER — PAGE NO.

☐ **Literature** ☐ **Have Representative Call**

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER, MAY 1942

NAME OF ADVERTISER — PAGE NO.

☐ **Literature** ☐ **Have Representative Call**

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER, MAY 1942

NAME OF ADVERTISER — PAGE NO.

☐ **Literature** ☐ **Have Representative Call**

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COMPANY

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TITLE

NAME OF ADVERTISER — PAGE NO.

☐ **Literature** ☐ **Have Representative Call**

NAME

COMPANY

ADDRESS

TITLE

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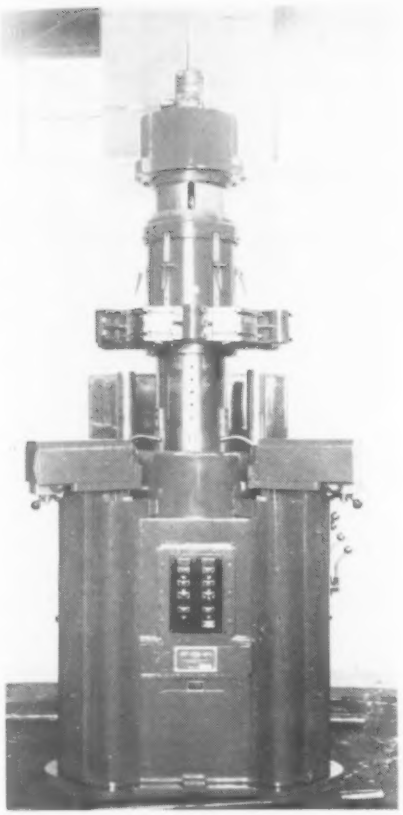


Chucking Machine
Has a vertical chuck.

ing a six-faced turret and two side heads adjacent to a central chuck. The turret reciprocates vertically on the column and is rotated by a selective indexing mechanism. The side heads, mounted at the front of the machine, are equipped for both vertical and horizontal motion.

Special valves, placed convenient to the operator, permit the head cycles to be selected for either vertical or horizontal motion. This permits the cut to be taken either upward or downward for turning, or the tool may be fed toward the center or from the center outward for facing cuts.

SEMI-AUTOMATIC MILLING MACHINE (G63)

Both roughing and finishing are performed by a machine, designed and built by the Snyder Tool and Engineering Company, Detroit, on which clearances for articulated connecting rods are milled in the master rods used in radial aircraft engines.

The machine is semi-automatic and will handle either solid or split-type rods. Since the cutting cycle of the machine is automatic, being hydraulically operated and electrically controlled, one unskilled operator is said to be able to maintain continuous production tending several such machines.

OPTICAL GRINDING MACHINES (G64)

A line of Lehmann optical grinding machines, said to be of latest design for maximum range to produce a great variety of work, has been announced by the George Scherr Company, 132 Lafayette Street, New York City.

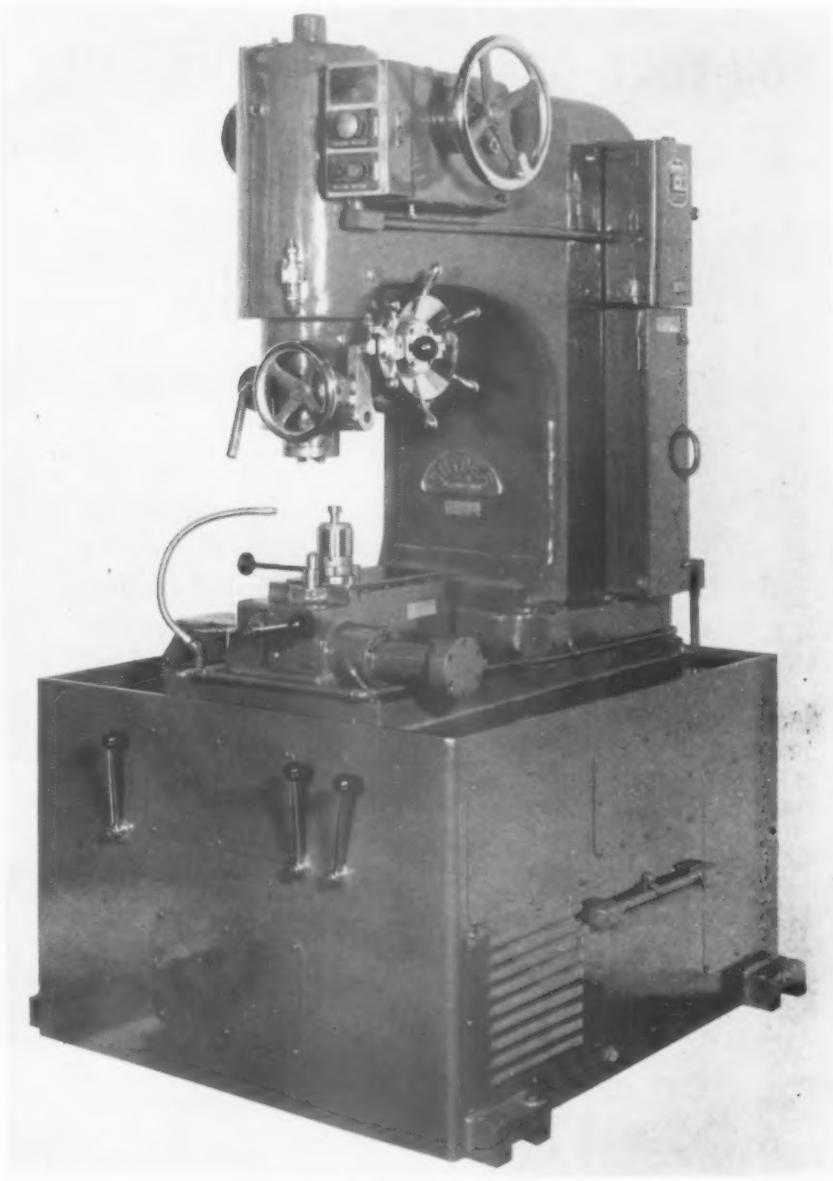
Illustrated is the six-spindle light duty polisher with hardened steel spindles running in tapered bronze bushings, adjustable for wear. The machine, frame, and table are of heavy construction for rigidity in operation. Adjustment of spindle and crank speeds are made by releasing pin stops in indexing discs and rotating cranks after disengaging friction described by hand levers.

A feature that is said to be appreciated by optical plants is the central lubrication system provided on all machines.

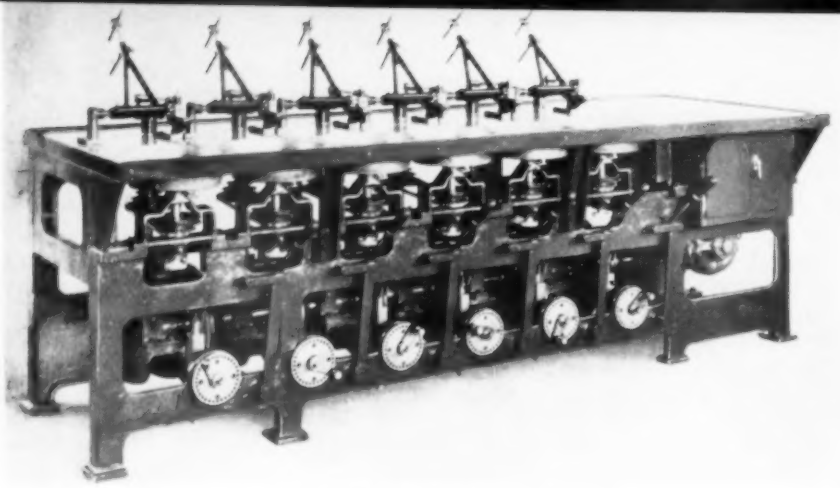
ROTOREX GRINDER (G65)

A universal tool and cutter grinder that is said to accurately perform the wide range of tool and cutter operations that occur daily in every machine shop, has been developed by the Douglas Machine Company, Inc., 150 Broadway, New York City.

This machine has been designed for convenient control of all levers from the operator's natural stand to permit better observation of work and quick and accurate setting of cutter clearances.



Snyder Semi-Automatic Milling Machine
Will handle either solid or split type rods.



Optical Grinding Machine
Has a central lubrication system.

NEW EQUIPMENT

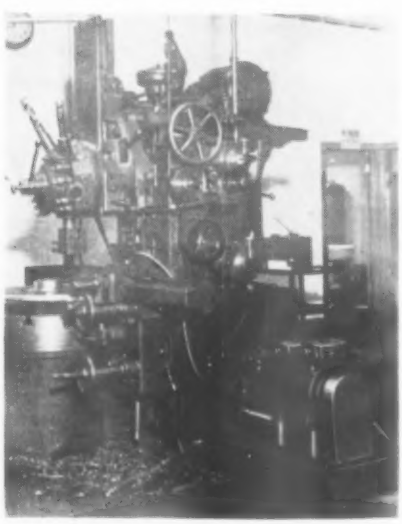
It is said to be adaptable to a wide variety of tools such as: Plain milling cutters, side milling cutters, face milling cutters, end mills, shell end mills, angular cutters, radius cutters, form cutters, gear tooth cutters, and gear hobs.

It is also adaptable to spline cutting hobs, saw blades, slitting saws, straight or spiral fluted reamers, counterbores and taps.

Rotorex Grinder
Convenient control of levers.

WESTERN SUPER TRANSMISSION (G66)

A transmission built by the Western Manufacturing Company, 3428 Scotten



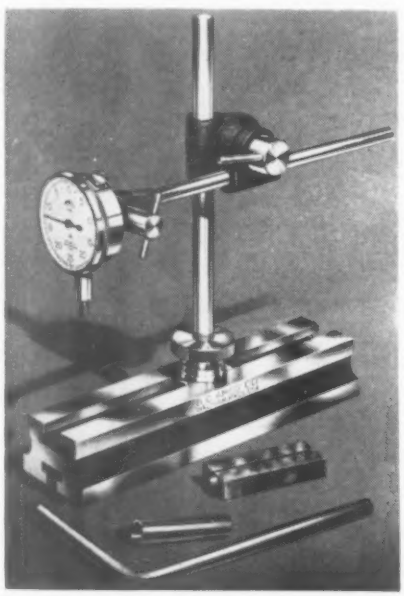
Western Transmission
Has eight speeds.

Avenue, Detroit, is said to be suited to the replacement of the gear boxes on all makes of large boring mills and radial drills. With eight speeds in geometric progression this transmission will handle motors from ten to thirty hp and also are used for motorizing large slotters, engine, and turret lathes.

Three models of "Multi Motor Mounting" adapt the three available models of Western transmissions to all kinds of machine tools.

DIAL TEST INDICATOR (G67)

Said to be an ideal testing outfit for machinists, tool-makers, inspectors, scrapers, and assemblers, a dial test indicator made by the B. C. Ames Company, Waltham, Mass., is handy for determining the flatness of surfaces, roundness and trueness of revolving parts, and relative heights and thicknesses.



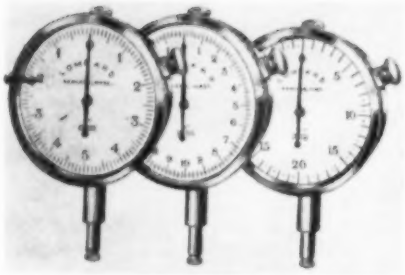
Ames Indicator
Adjustable to any position.

The indicator is adjustable to any position and is held securely by a lever style clamp. This can be removed thus making it possible for it to be used in lathes with the tool post clamp.

The indicator regularly furnished is an Ames No. 203 with ¼ inch spindle travel, graduated in thousandths and half-thousandths and numbered 0-25-0.

LOMBARD DIAL GAUGES (G68)

All of similar construction but with different degrees of amplification, three "A" type gauges, the A-10, A-20, and the A-30, are being made by the Lombard Governor Corporation, Ashland, Mass.



Lombard Dial Gauges
Have brass gears and cases.

Said to be ruggedly constructed to give long and accurate service, these gauges have brass gears and cases. The spindles are of stainless steel. They can be furnished with plain back if desired, for mounting by clamping on the bushing.

Dials are 2 inches in diameter and turn to set the zero to pointer position.

CARBIDE TOOL GRINDER (G69)

Equipped with a 3 hp 1150 rpm motor for use with an 18 inch diameter by 2½ inch face straight grinding wheel, this machine introduced by the Standard Electric Tool Company of Cincinnati is said to be designed for speed and efficiency.

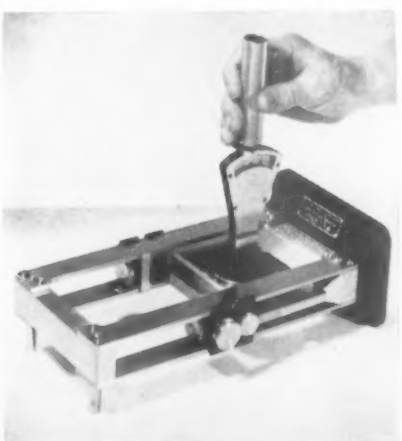
Suitable flanges are furnished to accommodate the size wheel with a 10 inch diameter hole. The outside diameter of the wheel flange is 15 inches so that the actual wheel waste is but a 1½ inch thick ring. On the opposite side the spindle is furnished with a steel plate to accommodate a mechanically mounted 14 inch diameter wheel for face or finish grinding.

The machine illustrated has a wet grinding attachment and separate toggle switch for controlling the motor driven pump.

Carbide Tool Grinder
Has wet grinding attachment.

INTERNAL SETTING GAGE (G70)

Designed to eliminate the old-fashioned, time wasting method of setting instruments and gages by using clamps and parallels with gage blocks, an internal setting gage has just been an-



Internal Setting Gage
Readings up to 6 inches.

nounced by the Dearborn Gage Company, Dearborn, Michigan.

Its gaging surfaces are said to be processed and finished to millionths in flatness, thereby making possible the ultimate in checking with the minimum of adjustment.

Another feature of the gage is that it can be used either vertically or horizontally to facilitate adjustments. The gage illustrated will cover readings up to 6 inches and models can be made to take care of any specific job within a reasonable range.

TORNADO VACUUM CLEANER (G71)

Built to take care of accumulated waste material coming from production and assembly operations, a new kind of cleaning apparatus has been developed by the Breuer Electric Manufacturing Company, 5100 North Ravenswood Avenue, Chicago.

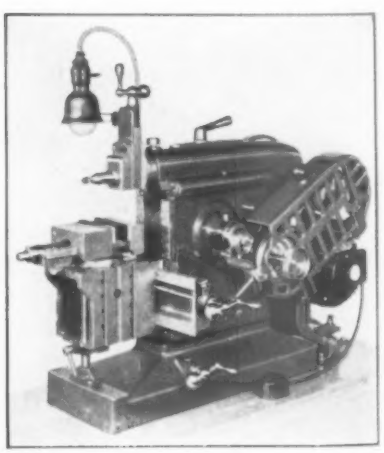
This new Tornado unit, besides being light and portable, is said to have the added feature of high-speed operation and durability. Continuous cleaning work is claimed possible because the absence of commutator or carbon brushes, with no such parts to replace or wear out, which not only prolongs the operating life of the machine, but also permits the unit to develop more power and speed.

Illustrated is Model 117 which has a hi-cycle motor that is made to operate on a 220 volt, 180 cycle current.

Tornado Cleaner
Takes care of waste material.

AMMCO PRECISION SHAPER (G72)

Available for stationary installation or mounting on a portable cabinet, a 7 inch precision shaper is being made by the Automotive Maintenance Machinery Company, North Chicago, Ill.



Ammco Shaper
Ways are of the "Vee" type.

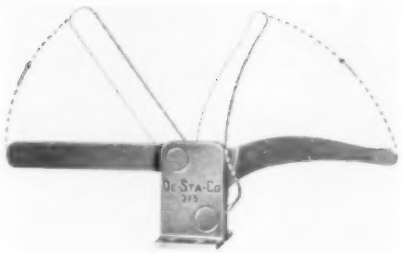
The ways of the ram, tool head, and front face of the main frame are of the

"Vee" type. Other features include a vise base that is provided with slots for the three working positions of the table, vise jaws that have steel insert plates, a tool head that is adjustable and graduated from 0 to 90 deg. for angle work, and a feed mechanism of the reversible and adjustable type.

LIGHT DUTY TOGGLE CLAMP (G73)

A new light duty, horizontal style toggle clamp has been added to the De Sta-Co line of clamps manufactured by the Detroit Stamping Company, Detroit, Michigan. Having a pressure ratio of 50 to 1, this clamp measures 8-11/16 inches across, 2-3/16 inches high overall, and 1⅜ inches by 2-1/16 inches at the base.

When in "shut" position, both the handle and clamping bar are in a horizontal position, thus reducing the height. The clamp weighs 8½ ounces.



Toggle Clamp
50 to 1 pressure ratio.

Plug Gages
Set includes cabinet.

PLUG GAGES (G74)

A set of plug gages, from .030 to and including .501, contained in a mahogany finished cabinet has just been announced by the United Precision Products Company, Chicago.

These "Dub Life" plug gages are single end, plain limit, with ends reversible. The cabinet is on rollers and has six drawers for the gages. It has a receding door which can be locked when not in use.

BALANCED HYDRAULIC VALVE (G75)

A new type of high-pressure hydraulic operating valve, which is said to overcome "pressure locking" and tiring valve-lever manipulation, has just been announced by the Galland Henning

Hydraulic Valve
Overcomes "pressure locking".

Manufacturing Company, Milwaukee, Wisconsin.

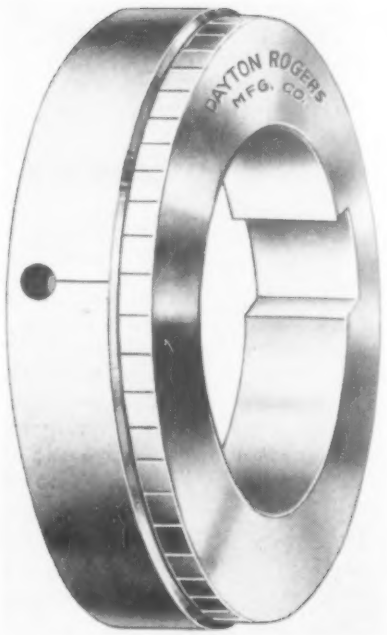
This new balanced valve has only one moving part. It is built in four sizes to fit the most common sizes of hydraulic pressure lines, $\frac{3}{8}$, $\frac{1}{2}$, and $\frac{3}{4}$ inch.

It is claimed that because the hydraulic pressure inside of this new type valve is always balanced, it can never be "pressure locked". Also, the lever is just as easy to operate from the "on" position as from "neutral".

ADJUSTABLE SPACING COLLARS (G76)

New precision adjustable spacing collars made in eleven sizes and said to be well adapted to all gang milling setups have just been announced by the Dayton Rogers Manufacturing Company, 2830 Thirteenth Avenue South, Minneapolis, Minn.

It is claimed that they are so constructed that they can accurately space all straddle milling, gang milling, and multiple slotting milling machine setups. The collars have a maximum adjustment of 1/16 inch, and are graduated by thousandths.

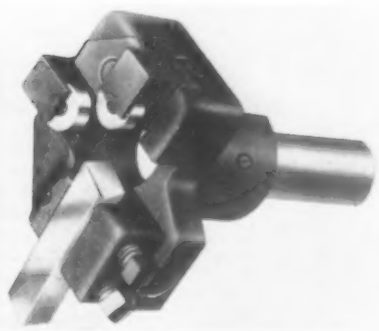


Adjustable Spacing Collar
Made in eleven sizes.

SCREW MACHINE BOX TOOL (G77)

Offered in three sizes, 00, 0, and 2, a new screw machine tool has been developed by the Boyar-Schultz Corporation, Chicago.

Made of strong forgings and heat treated alloy steels and finished to close limits, it is claimed to have the strength and accuracy necessary for long runs at very close tolerances.



Screw Machine Box Tool
Has strength for long runs.

CORRECTION

The illustration of Haynes Stellite cutting tools at the top of page 144 of our March issue shows the rough-turning of a motor reducer high-speed pinion shaft and not a grooving operation.

NEW LITERATURE . . . . . .

Of Interest to the Tool Engineer

(396) Gage Design

American Gage Design Standards. 16 pp. Lincoln Park Tool and Gage Company, Lincoln Park, Michigan. This book contains material compiled from information published by the National Bureau of Standards, U. S. Department of Commerce. This booklet is full of charts and illustrations essentially of interest to inspection men and engineers.

(397) Metal Cleaning

. . Scientific Metal Cleaning. 12 pp. Detroit Rex Products Company, 13007 Hillview Avenue, Detroit. This booklet discusses solvent degreasing and its use in removing all oil and grease from all kinds of metal products. Detrex degreasing machines are shown and the work they do. It is completely illustrated and lists industrial applications of Triad alkali cleaners.

(398) Rigidmil

Specifications of a No. 0 Hydraulic Rigidmil. 8 pp. The Sundstrand Machine Tool Company, 2531 Eleventh Street, Rockford, Illinois. Included in this booklet is a discussion on typical cost reducing operations. The machine is described, illustrated, and line drawings are given of various operations. Complete specifications are given on the last page.

(399) Gages

Sheffield Visual Gages. 16 pp. Sheffield Gage Corporation, Dayton, Ohio. An introduction to the visual gage is given at the first of the booklet. Then all the various models are described and illustrated. Pictures show the visual gage in actual working operations.

(400) Salt Baths

New and Better. 4 pp. Park Chemical Company, 8074 Military Avenue, Detroit. This booklet deals with new and better salt baths in the heat treatment of high speed steel. A complete series of high speed steel salt baths for all types of high speed steel is given.

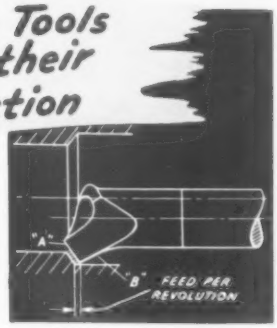
(401) Internal Grinding

Majestic Internal Grinding Machine. 6 pp. Majestic Tool & Manufacturing Company, Detroit, Michigan. This folder describes the various parts of the grinding machine and gives their specifications. It includes drawings and pictures. Charts on standard removable quills are given.

(402) Milling Calculator

Select the Right Feeds and Speeds Quickly. 12 pp. The Cincinnati Milling Machine Company, Cincinnati, Ohio. This booklet tells how to use a new calculator put out by the Cincinnati Milling Machine people. Each step of the recommended procedure is described in detail. The calculator, which is priced at 50 cents, is designed to aid in quickly selecting the correct cutting speeds and feed rates for many milling jobs. The size and kind of cutter, the work material, depth of cut, cutting speed, feed rate, and horsepower required are all calibrated on the dials. By properly setting the dials for each situation, you can determine the most effective combination.

Bokum Boring Tools always retain their free cutting action



The angle of the cutting edge and the special helical backed-off form of the front of the tool (A and B) produce a free-cutting action that is constantly retained—even through resharpening.

The greatest cutting force is always directed towards the largest cross section of the cutting tool, consequently, the tool can stand much more feed than can the ordinary boring tools. In spite of the increased feed, the tool will not shatter, because the material removed is not taken squarely at right-angles but at a favorable slant that produces a smooth bore, true to size.

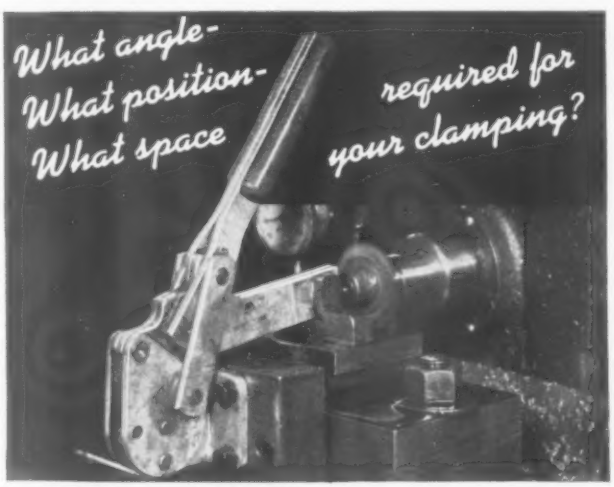
For speed, economy, accuracy, and efficiency, you'll use Bokum Boring and Internal Threading Precision Tools.

Send for Catalog No. A 1-139.

Available also Carbide Tipped.

Ask for Catalog No. A 1-1398.

BOKUM TOOL CO. 49 W. Hancock Ave. DETROIT, MICH.



YOUR ANSWER:
KNU-VISE Toggle Action CLAMP

After base is fastened permanently in vertical or horizontal position, clamp can be swung to any angle between 90 to 180 degrees, thereby giving versatility in clamping work. Clamps exert unyielding bull-dog grip, which can be instantly released by throw of handle. Same powerful pressure is applied on each successive operation—no delays experienced in making time-consuming adjustments—production carries on without interruption.

If you have a clamping problem, we can solve it for you. We have clamps for practically every operation encountered in metal-working—for machine shops, welding requirements, and many useful functions in the aviation industry.

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INCORPORATED

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CALIFORNIA OFFICE
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Glendale, Cal.

For worn taps, reamers, cutting tools, dies, plug gages, arbors, etc. . .

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Hard and Bright Chromium, Copper, Nickel and Cadmium Plating: Oxidizing, Pickling, Polishing

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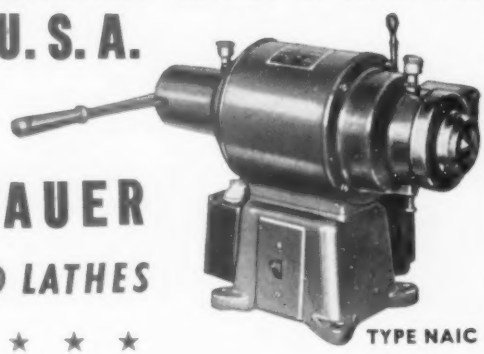
TEAMWORK WILL WIN FOR THE U. S. A.



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SPEED LATHES

★ ★ ★ ★ TYPE NAIC

. . . . are helping to produce faster and better for the munition factories the war supplies needed by our military forces. All are working together—the tool maker—the munition maker—and the men using the tanks, planes and guns. Such teamwork will continue to give us more victories to win the war.

SCHAUER SPEED LATHES ***Burnish, polish, lap and burr*** machine parts.

Manufactured by
"the originators of today's Speed Lathes"

SCHAUER MACHINE COMPANY
2066 Reading Road Cincinnati, Ohio

(403) Carburizing

The Hevi Duty Carburizer. 24 pp. Hevi Duty Electric Company, Milwaukee, Wisconsin. This bulletin describes the construction of the carburizer, the gas circulation, gas velocity, penetration, economies and operating costs, and the many uses and advantages. It is illustrated and includes many pictures of typical installations. Complete specifications are given.

(404) Tools

Firthite General Purpose Tools. 10 pp. Firth-Sterling Steel Company, McKeesport, Pa. This bulletin has conveniently punched holes for filing in your data notebook. It lists the sizes and prices of the general purpose tools. It is illustrated and drawings of the possible variations of the tools by simple grinding are shown.

(405) Collet Fixtures

Zagar Collet Chucking Fixtures For Faster Holding and Indexing. 4 pp. Zagar Tool, Incorporated, 23885 Lakeland Blvd., Cleveland, Ohio. This folder gives the feature of the collet and shows how it is used in milling, turning, tapping, and drilling. The overall dimensions are given and the prices.

(406) Contour Machining

Doalls On Production. 78 pp. Continental Machines Incorporated, 1301 Washington Avenue South, Minneapolis, Minn. This is a book of photographs taken of these contour machines in actual operation. Each photo shows a different application for this machining process. Included among the more than 100 photos in the book are those picturing the shaping of massive gun mounts, breech rings, wrist pins, connecting rods, aircraft templates. The book is said to be of great reference value to plant production engineers.

(407) Cleaning Machines and Solutions

L & R Industrial Cleaning Machines and Cleaning and Rinsing Solutions. 8 pp. L & R Manufacturing Company, 54-56 Clinton Street, Newark, New Jersey. This illustrated booklet tells of the many interesting uses for this cleaning machine and solution, which includes a new way of cleaning precision devices said to be very effective.

(408) Metal Duplicating Without Dies

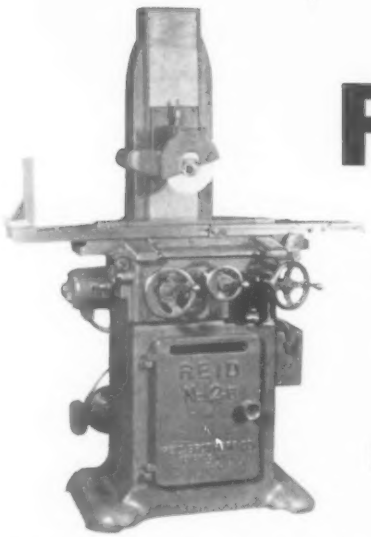
The Di-Acro System of Metal Duplicating Without Dies. 32 pp. O'Neil Irwin Manufacturing Company, Minneapolis, Minn. This catalog completely describes and illustrates an original process for duplicate forming of parts or pieces to die accuracy using precision machines. Many examples of work done by these machines are shown.

(409) Speed Lathe

Schauer Speed Lathe Catalog. 24 pp. Schauer Machine Company, 2066 Reading Road, Cincinnati, Ohio. Designed to conserve the buyer's time, this catalog is concise and condensed while at the same time contains all the necessary specifications. Beginning with the basic construction of lathes, this catalog lists many types. Special applications for many different finishing, polishing, lapping, and burring operations are illustrated.

(410) Instruction Cards

Grinder Instruction Cards. Diamond Tool Company, 938 East 41st Street, Chicago. These cards, which have valuable precision dressing suggestions printed on them, have been made in an endeavor to promote accuracy and cooperation among precision grinder operators. The cards are punched and can be hung on the wall.



THE

REID

2B All Electric Automatic and Hand Feed Surface Grinder

THE Reid All Electric Surface Grinder is equipped with a motorized spindle, thereby eliminating all belts, pulleys, and counterweights. Table and cross slide are equipped with oil rollers, insuring greater life and proper lubrication. Table is operated with a silent chain instead of rack and pinion gears. Grinding capacity 6 x 18 x 11. Additional height if required on all standard machines. Send to Dept. O for descriptive literature.

Exclusive Sales Agents

H. LEACH MACHINERY CO.
387 Charles St., Providence, R. I.
A Reid Distributor in Every Principal City

MAGNETIC CHUCK USERS SAVE MONEY WITH

NEU-TROL

NEW BULLETIN NO. 21
Gives Full Information

NeuTrol provides quick release of the work piece from the chuck—demagnetizes the work as it releases it.
NeuTrol eliminates "hammer and pry". Just turn the power "Off" and you can pick up the work piece in a few seconds. NeuTrol eliminates waste time—saves the chuck—eliminates injury to the operator. NeuTrol can be easily installed on grinding machines now in operation—or on new grinders by grinding machine manufacturers.

Two types: Motor Controlled for Remote Control—and Manual Controlled for small units. "There's a NeuTrol for every size of chuck."

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Etching Stamps
FOR INSPECTION MARKING

SUPPLIED IN LETTERS—FIGURES—SYMBOLS OR SPECIAL DESIGNS

Extra deep . . . sharp face . . . acid resisting rubber stamps are supplied with one or more letters, figures, symbols or special designs . . . for all types of inspection and code marking of metal parts or products. Impressions are neat and legible, on steel, bronze, brass or other metals. Supplied with solid or open face characters or design. Write for full information and prices.

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FOR FAST, ACCURATE LOW COST INDEXING

HARTFORD SUPER-SPACER

This flexible device for speeding indexing on a variety of operations—milling, drilling, slotting, planing—should be in your shop. Produces maximum production at minimum cost from present machine tools.

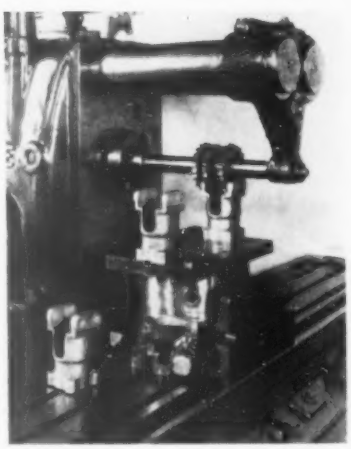


Illustration shows Hartford milling 3 surfaces in tough alloy castings. Operator loads one piece while another is being machined. Vertical feed used. Possibilities for similar applications are endless.

Write today for descriptive circular

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD, CONN.

NEW LITERATURE

(411) Screw Thread System

Aero-Thread. 4 pp. Aircraft Screw Products Company, Inc., 4723 35th Street, Long Island City, N. Y. This folder shows this new screw system and how it works. Illustrations are given.

(412) Die Sets

Die Sets and Die Makers' Supplies. Detroit Die Set Corporation, 2897 West Grand Blvd., Detroit, Michigan. In this booklet just off the press, die sets and supplies are fully described and completely catalogued.

(413) Wheel Dressing

An Entirely New Principle In Wheel Dressing. Wheel Trueing Tool Company, 3202 West Davison, Detroit. This broadside features the "Tru-Line Principle". It also contains complete descriptions of a line of standard, special feature, thread dressing, turning and boring, radius forming and gage tools, and of their special design core of bit.

(414) Ovens

Convected Air Heat Efficiency. 4 pp. Despatch Oven Co., Minneapolis, Minn. This folder gives typical applications of oil fired heaters along with features and illustrations. Specifications are given for heating systems that will improve ovens, dryers, and furnaces.

(415) Drills and Reamers

Drill and Reamer Facts. 32 pp. Whitman and Barnes, 2108 West Fort Street, Detroit. This booklet has a drill facts section which describes the design of drills, correct drill pointing, and suggestions in the proper use and care of drills. The reamer facts section contains a short treatise on the design etc., of reamers.

NEW BOOKS

How To Run A Lathe by J. J. O'Brien and M. W. O'Brien. 128 pp. 25 cents. South Bend Lathe Works, Department T7, South Bend, Indiana. This book is said to contain the latest information on the operation and care of metal working lathes. It covers such subjects as the operation of the lathe units, grinding cutter bits, making accurate measurements, plain turning, chuck work, taper turning, boring, drilling, reaming, tapping, cutting screw threads, and reference tables. This is the 41st edition of this book and a number of changes in text material and illustrations have been made since the 1941 edition. Used as a shop text in many schools and apprentice training courses,

—NEW LITERATURE—

this book has over 365 illustrations.

Machine Shop Work by John T. Shuman, Coordinator, Williamsport Technical Institute. 499 pp. $3.50. American Technical Society, Publishers, 58th at Drexel Avenue, Chicago. The purpose of this book is to help the beginner obtain a better understanding of the fundamentals and principles of modern machine shop practice. The book approaches machine shop work from the how-to-do-it viewpoint. Emphasis is placed on the fundamentals behind the tools of the trade, with special attention given to the operation of the standard machine tools. Among the helpful features of the book are the trouble-shooting pages found at the end of each chapter on machine tool operation.

Dimensional Control. 64 pp. $1.50. The Sheffield Gage Corporation, Dayton, Ohio. This book has been published to meet the need for new technical literature throughout plants, engineering schools, and defense classes. It is written on the theme of the use of gages in modern industry. There are 82 illustrations in the book. The book also contains a resume of the history of standards in gaging.

—HANDY ANDY SAYS—

(Continued from page 136)

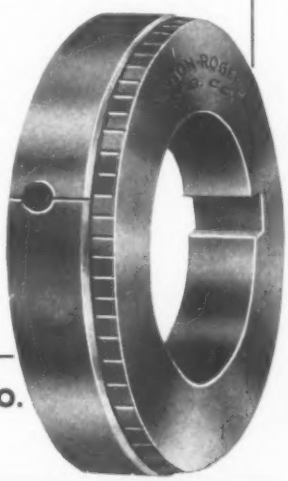
generally get a thrill of pleasure when I meet some old crony in our pages. Well then, let's have more of it! I want to see if Arnold Thompson spills cranberry sauce on his soup and fish and does an Emily Post or if Earl Ruggles has bought that toupe yet, — I'm painting hairs on my pate — and the only way we'll find out is that each Chapter editorial chairman sends in the news. Sure, I've got my ear to the ground and all that but I can't hear what's going on from Maine to California or from Washington to Florida and points between. So, get your stuff in, and before the 15th, so as to give us time to get it into shape. And mail it to THE TOOL ENGINEER, 2842 West Grand Blvd., Detroit (the address is on the title page) so as to save time. We're with you 'til the cows come home, only, you milk your own cow and send us the cream. We'll churn it into butter and salt to suit.

Yours Handily,

ADJUSTABLE SPACING COLLARS

for PRODUCTION MILLING

Don't overlook this very important factor to assure better and quicker results for accurately spacing of all side milling cutters, gang milling, and various other multiple milling machine setups. . . . These new precision adjustable spacing collars for milling machine cutter arbors lend themselves for spacing quickly and accurately all production milling operations. These adjustable collars fit all milling machine cutter arbors and are graduated in thousandths, having maximum adjustment of 1/16", assuring precision and positive spacing adjustment at all times.



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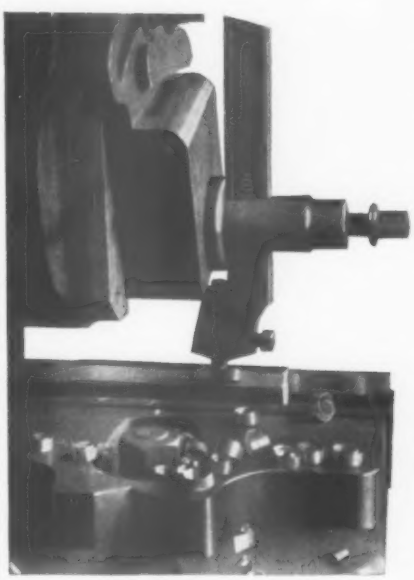

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Cutting point is on the line of deflection.

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THE PASSING PARADE . . . .

Promotions . . . Personals . . . Deaths . . .

RALPH E. FLANDERS, president of the Jones & Lamson and Bryant Chucking Grinder Companies in Springfield, Vt., and his brother, *ERNEST V. FLANDERS*, were honored at the Medal Day exercises of the Franklin Institute April 15th at Philadelphia.

The brothers were presented jointly the Edward Longstreth medals, awarded for inventions of high order and for meritorious improvements and developments in machines and mechanical processes.

Ralph and Ernest Flanders received the awards for their contribution in inventing and perfecting the Jones and Lamson automatic thread grinder.

CHARLES A. WOODLEY, formerly assistant factory manager of the Tractor Plant, Caterpillar Tractor Co., has been advanced to the position of factory manager, a position made vacant by the advancement of *JAMES R. MUNRO* to the position of general factory manager. Mr. Woodley is a member of the Peoria Chapter of A.S.T.E.

Ralph E. Flanders
Receives medal.

Charles A. Woodley
Factory Manager of Tractor Plant.

CARL A. HOLMER has recently been appointed Tool Room superintendent of the Caterpillar Tractor Co. Tractor Plant. Mr. Holmer was formerly general foreman of the Machine Repair Department. He is also the newly installed

Chairman of the Peoria Chapter of A.S.T.E.

Announcement has just been made of the change of the name of *W. C. LIPE, INC.*, Syracuse, N. Y., to *LIPE-ROLLWAY CORPORATION* which is effective immediately. The new Lipe-Rollway Corporation intends to purchase a substantial majority of the capital stock of Rollway Bearing Co., Inc., with a portion of the funds to be provided by an increase of $1,100,000 in the company's capitalization.

JAMES K. FULKS was appointed vice president in charge of manufacturing of the Ex-Cell-O Corporation, Detroit, Michigan, at a recent annual meeting. Mr. Fulks joined the company in 1925. Since November, 1940, he has been factory manager for Ex-Cell-O.

FLINT C. ELDER, JOHN S. RICHARDS, JAMES R. THOMPSON and *LAWRENCE H. DUNHAM* figure in four personnel changes announced by the American Steel & Wire Co. Mr. Elder, Director of Research, has been named research engineer assigned to special work for the vice president and

Carl A. Holmer
Now Tool Room Superintendent

has been replaced by Mr. Richards, former manager of the Metallurgical Department. Mr. Thompson, assistant manager of the Metallurgical Department, succeeds Mr. Richards and Lawrence H. Dunham takes his post.

James K. Fulks
An Ex-Cell-O vice-president.

DAVID F. ROBINSON, New York District Sales Manager of Wm. Sellers & Co., Inc., has been granted a leave of absence for the duration, and is now working under Commander Paul E. Piehl of the U. S. Navy Aeronautics Bureau in Washington.

J. D. YOUNG has just been appointed as Manager of Pump Sales and

The Improved Nielsen Live Centers

LOAD CAPACITY—200 TO 40,000 LBS. AT 100 RPM.

HAVE ADJUSTMENT TO TAKE UP WEAR AND PRELOAD BEARINGS

STANDARD MORSE TAPER No. 2 TO 6 IN STOCK

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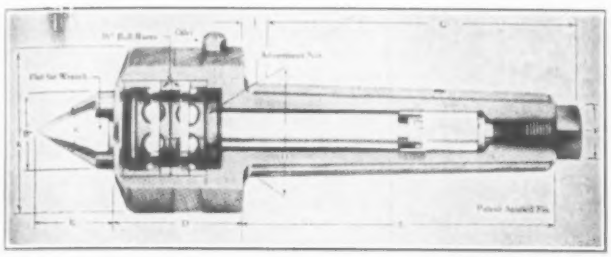

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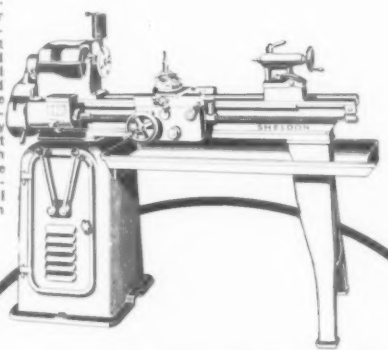

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This is a quality precision lathe with large special analysis steel spindle ground all over and 1" round collet capacity. Hand scraped Bronze Spindle bearings. (Also available with Ultra-Precision Ball or Super-Precision Roller spindle bearings), Full Quick-Change Gears. Double-walled Worm Feed Apron with Power Cross Feed, Heavy strutted and cross-braced semi-steel bed with hand scraped ways (2 V-ways and 2 flat ways) and U-type Lever-operated 4 speed Motor Drive.

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PASSING PARADE

W. J. WAGNER as assistant to the president of The Tuthill Pump Co., Chicago, Ill.

R. S. AHLBRANDT, Pittsburgh District Sales Manager for Allegheny Ludlum Steel Corporation, has just been given a leave of absence to accept a Lieutenant's commission in the United States Navy. Mr. Ahlbrandt was a graduate of Annapolis, and a member of the Naval Reserve.

Clarence W. Krueger
Whitman & Barnes Sales Head

CLARENCE W. KRUEGER has been appointed Sales Manager of Whitman & Barnes with headquarters in Detroit. *MR. GEORGE W. CLARKSON* has been named to fill Mr. Krueger's former position as manager of Whitman & Barnes' New York Sales Office.

NESTOR PETERS has just been appointed Chief Tool Engineer of the Spartan Aircraft Co., Tulsa, Okla. *HAROLD J. LITTLETON* has been named Tool Planning Supervisor in a personnel alignment at this plant.

The Bureau of Industry Advisory Committee has announced the formation of a Machine Tools Industry Advisory Committee. *GEORGE BRAINARD*, Chief of the Tools Branch, is Government Presiding Officer.

The Committee members are: *H. S. BEAL*, general manager, C. B. Cottrell & Sons, Westerly, Rhode Island; *A. G. BRYANT*, sales manager, Cleereman Machine Tool Co., Green Bay, Wisconsin; *RALPH W. BURKE*, gen. sales mgr., Kearney & Trecker Corporation, Milwaukee, Wisconsin; *RALPH E. FLANDERS*, pres., Jones & Lamson

PASSING PARADE

Machine Co., Springfield, Vermont; *A. K. INGLE*, pres., Consolidated Machine Tool Corp., Rochester, New York.

Other members of the board include *R. F. INGRAM*, secretary and sales manager, Landis Tool Company, Waynesboro, Pennsylvania; *GEORGE H. JOHNSON*, pres., Gisholt Machine Co., Madison, Wisconsin; *T. S. ROSS*, pres., Rivett Lathe & Grinder, Inc., Boston, Massachusetts; *W. W. TANGEMAN*, vice pres., Cincinnati Milling Machine Co., Cincinnati, Ohio; *R. J. WHITING*, works manager of the Hydraulic Press Mfg. Co., Mt. Gilead, Ohio; and *J. F. MILLER*, of the Ex-Cell-O Corporation, Detroit, Michigan.

W. C. BUCHANAN, President of Allis-Chalmers Manufacturing Company, has just resigned because of ill health. Mr. Buchanan retains his membership on the board of directors and executive committee of Allis-Chalmers Manufacturing Company.

FRANK A. HITER, vice-president and General Sales Manager of Stewart-Warner Corporation, was elected a director at a recent meeting of the board of directors of that company. Mr. Hiter replaced *THOMAS T. SULLIVAN*, retired.

Died

William M. Ziegler
In Detroit since 1941.

WILLIAM M. ZIEGLER, head of the Ziegler Tool Company, Detroit, Michigan, died at his home on April 13th.

Born in Saxony, Germany, 61 years ago, Mr. Ziegler lived in this country 55 years. He was educated at Cincinnati, Ohio, and started in the tool business there 37 years ago. He came to Detroit in 1931, where he opened his own tool company. His son, *WILLARD D. ZIEGLER*, is carrying on his father's business.

MAY MEETINGS

BINGHAMTON, N. Y. — May 6, 7 P.M. Hotel Sherwood, Green, N. Y. Speaker of the evening will be Mr. R. O. Beardsley, Manager of the Thread Tool Division, Jones and Lamson Machine Company, whose subject will be, "Inspection by Projection."

CINCINNATI, OHIO—May 16, Annual Dinner Meeting at the Hotel Alms. Principal speaker will be Mr. W. W. Finlay, Manager of the Cincinnati plant of the Wright Aeronautical Corporation.

ELMIRA, N. Y.—May 4. This meeting will take place at the Mark Twain Hotel.

HAMILTON—May 7, 7 P.M. Welland House, St. Catharines. "Gear Shaving", will be the topic of the speaker, Mr. R. Drummond of the National Broach and Machine Company.

MILWAUKEE — May 14, Dinner 7 P.M., Technical Meeting 8 P.M. Colonial Room of the Republican Hotel. The speaker will be Mr. R. A. Hammond of the engineering staff of the General Electric Corporation. A sound movie will be shown in connection with the speaker's topic, "Beating Time."

PEORIA—May 5, 6:30 P.M. Creve Coeur Club. The speaker will be Mr. Peter Rossman, Research and Development Engineering, Curtiss-Wright Corporation. His subject will be, "Dies and Tools for Making Airplane Stampings. Reservations: E. Bowton, phone 2-6984.

PHILADELPHIA — May 21, 6:15 P.M., Engineers Club of Philadelphia. The speakers will be Mr. J. H. Quick and Mr. W. J. Shay, head of the Manufacturing Methods department and chief of the Time Study department respectively of the Radio Corporation of America. Their topic will be, "The Influence of Work Simplification" (motion economy on die, jig, and fixture design) with movies illustrating before and after production.

ROCHESTER—May 13, Dinner 6:30 P.M. University of Rochester, Todd Union. Mr. Herbert Gardner of the De Walt Products Corporation will be the speaker for the evening and will show movies of army camp construction. Reservations: C. G. Newton, Stone—2893.

SOUTH BEND—May 12. Technical part of the evening will include a colored sound movie by the TWA entitled, "Winged Horizons".

SCHENECTADY — May 21, 6:15 P.M. "Ten-O-One" Veterans Hall. Speakers will be: Col. Van Meter, Commanding Officer of the Schenectady Army Depot; Capt. J. E. Evans, United States Navy; and Mr. H. E.

MEETINGS

Linsley, Wright Aeronautical Corporation, who will show a movie on the Wright "Cyclone" engine. This will be ladies night. Reservations: N. Y. Coxe, Room 235 Building 41, General Electric Company.

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TOOL ENGINEER, combining MATURED EXPERIENCE with ADVANCED IDEAS, wants position as master mechanic, consultant or equivalent with progressive concern. College trained, with a broad shop practice, and more than average inventive and designing ability, advertiser may be considered adequately experienced in TOOL and INDUSTRIAL ENGINEERING — a PRODUCER with a record of ACCOMPLISHMENT, and fully qualified to project war contracts on a mass production basis. Commensurate salary expected; location preferred, Detroit metropolitan area; available as of May 15th. Address Box 733, THE TOOL ENGINEER.

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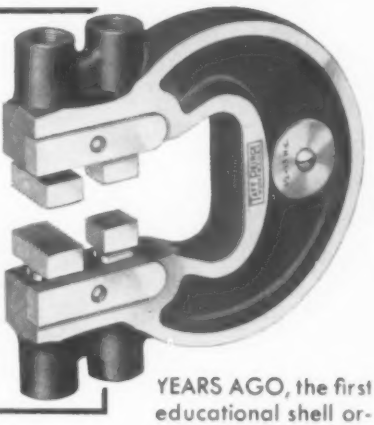

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Here, production shifts into higher speed than ever, assuring prompt service on the complete Taft-Peirce Thread Gage line, which includes all AGD Standards and many special types. This line is shown in the Taft-Peirce Handbook. A line on your letterhead brings a copy to your desk.

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- No boning.
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- 50 to 80 thousandths expansion.
- Cannot fall in slots or oil grooves
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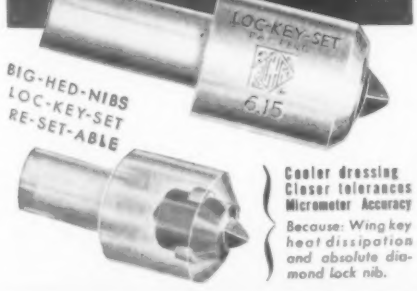

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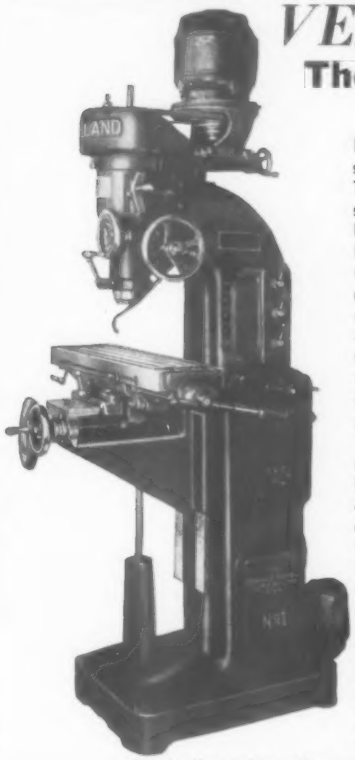

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It is a completely new machine, designed and built with all these requirements in mind, by a company whose principal business for 20 years has been creating special machines for the high production industries.

Longitudinal feed is 18"; cross travel, 8½" and vertical travel, 16". The table has a working surface 8" by 32". Two optional ranges of 12 spindle speeds each are offered, from 100 to 1750 r.p.m. or 200 to 3475 r.p.m.

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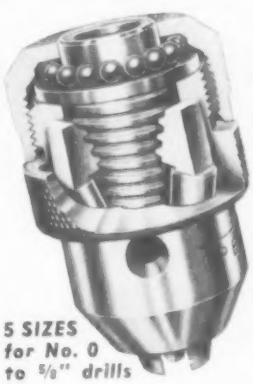

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Because they eliminate the key, these chucks have been favorites with shop men for over 20 years. Now, when every minute is important, the time and energy saving KEYLESS feature of Ettco-Emrick Drill Chucks is more valuable than ever. And as for quality and dependability—there are no better chucks made.

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